CHAPTER 2: AFFECTED ENVIRONMENT

This chapter describes the existing conditions with respect to the issues identified during scoping. It provides a foundation, or baseline, by which to compare the consequences that could occur from implementing any of the management philosophies, strategies, or tools contained within each of the alternatives described in Chapter 3. This chapter focuses on the resources that are most relevant to the issues raised by the public and the alternatives designed to address them.

A Review of the Gray Wolf in Montana

History

The gray wolf was extirpated from the western United States during the 1900s, primarily due to loss of habitat and conflicts with people. In 1884, the first statewide bounty law was passed in Montana. That first year, 5,450 wolf hides were presented for payment. All but three Montana counties reported a bounty payment for wolves from 1900-1931 (Riley 1998). Wolves as a self-sustaining breeding population were probably extinct in Montana by the 1930s. Tracks, scat, and/or observations of large canid-like animals (individuals and occasionally a pair) were either reported or killed up until the 1970s (Curnow 1969, Singer 1975, Singer 1979, Flath 1979, Day 1981, Ream and Mattson 1982). Most are thought to have been dispersers from Canada and little to no successful breeding activity was evidenced or sustained consistently through time since the 1930s. It is also possible that wolf-hybrids were being reported. Wolves were not legally protected in the U.S. until 1974. At that time, they were classified as "endangered" in all of the lower 48 states except Minnesota, where the gray wolf was classified as "threatened."

In 1980, the Northern Rocky Mountain Wolf Recovery Team completed a plan, which would guide wolf recovery efforts for a future wolf population in the northern Rockies. The plan designated three recovery areas -- Northwestern Montana, Central Idaho, and the Greater Yellowstone Area (GYA)--each of which included some portion of Montana (Figure 1).

In 1986, the first wolf den in over 50 years was documented within GNP. Since then, new packs have established throughout western Montana due to dispersers from Canada and the GNP area. To hasten recovery in the other two areas, USFWS reintroduced a total of 66 wolves from Alberta and British Columbia into central Idaho and YNP in 1995 and 1996.

Current Population Status and Distribution

Gray wolves are thriving and expanding in number and distribution in Montana, Idaho, and Wyoming (Figures 1 and 2). Within Montana alone at the end of 2002, there were approximately 183 wolves in about 34 packs distributed primarily in western Montana (Figures 3 and 4). While wolves are still found primarily in northwestern Montana and in the GYA, new packs are establishing along the Montana/Idaho border, in south central Montana, and outside the northeastern corner of YNP. There have been occasional reports in the Crazy, Highwood and Snowy mountains, but no breeding pack has been confirmed. The wolf population in the northern Rockies met the biological recovery levels at the end of 2002.

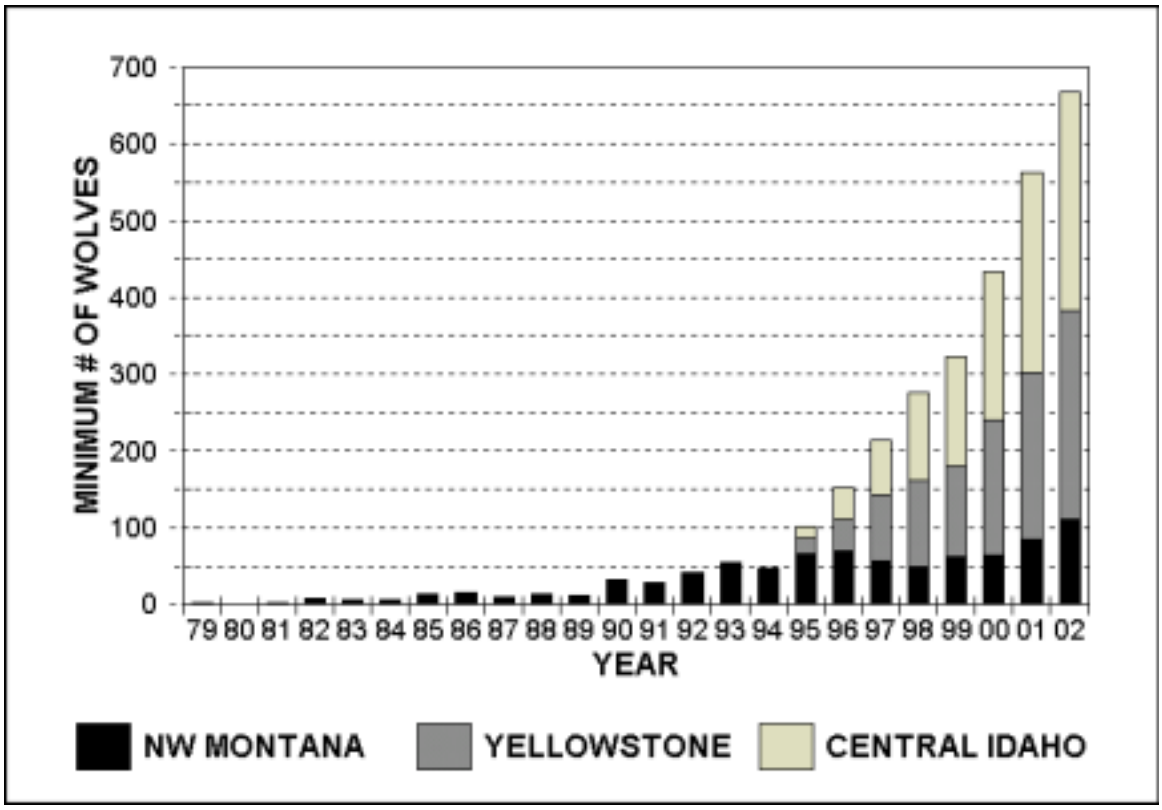

Figure 2. Grey wolf population trends in the Northwestern Montana, Greater Yellowstone, and Central Idaho recovery areas from 1979-2002. (Source: USFWS et al. 2002, and USFWS unpubl. data as of February 2003).

Ecology

Physical Characteristics. Male gray wolves in Montana weigh 90-110 pounds, and females weigh 80-90 pounds. About half of the wolves in Montana are black and the remainder gray. Both color phases may be found in a pack or in one litter of pups. Tracks are normally 4.5 to 5.5 inches long (Harris and Ream 1983).

Wolves may resemble coyotes, particularly when wolves are young. Wolves may also be confused with some large domestic dog breeds. Wolves are distinguished from dogs by their longer legs, larger feet, wider head and snout, narrow body, and straight tail. Other distinguishing characteristics require closer examination than is possible in field settings with live animals. In many instances, actual behavior must be used to distinguish wild wolves from wolf-dog hybrids and domestic dogs (Boyd et al. 2001, Duman 2001).

Pack Size. The highly social gray wolf lives in packs. Packs are formed when male and female wolves develop a pair bond, breed and produce pups. The pack typically consists of a socially dominant breeding pair (alphas), their offspring from the previous year, and new pups. Other breeding-aged adults may be present, but they may or may not be related to the others. Cooperatively, the pack hunts, feeds, travels, and rests together. The pack also shares pup-rearing responsibilities, including hunting and tending pups at the den or at a series of rendezvous sites. Pack size is highly variable, ranging from as few as three to as many as 37 (USFWS et al. 2001).

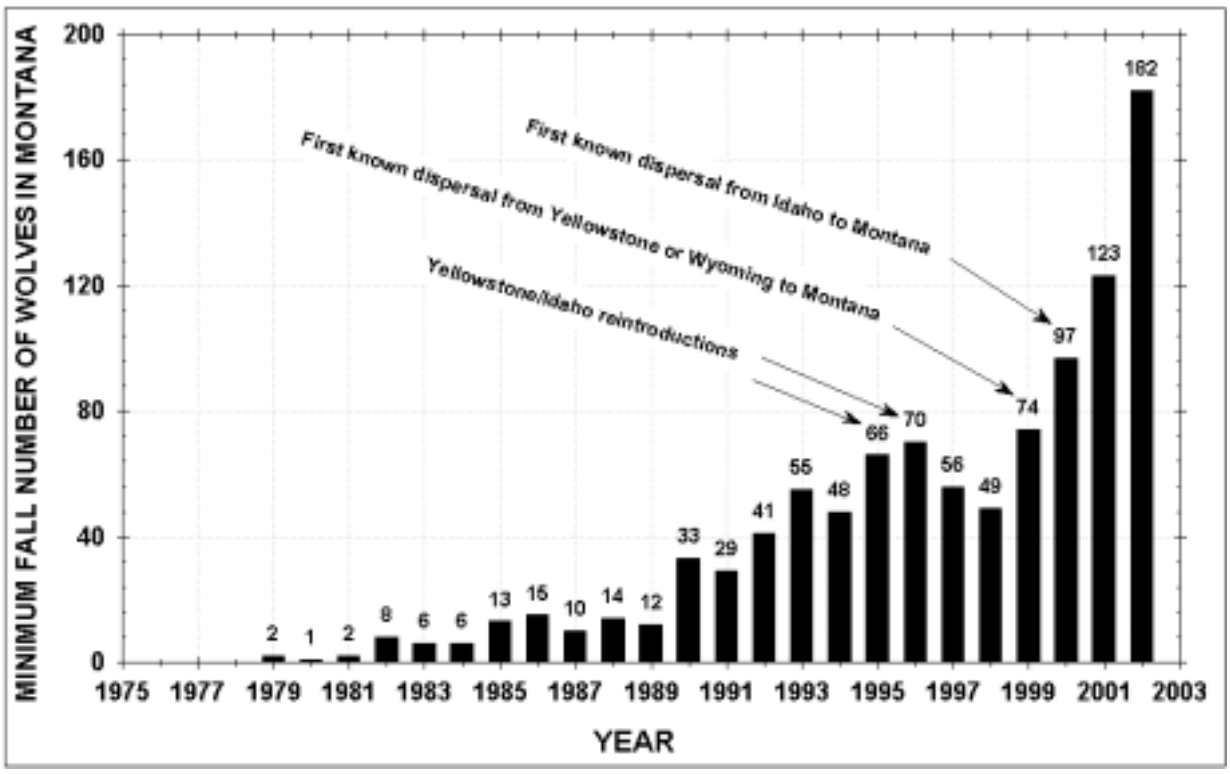

Figure 4. Minimum fall number of wolves in the State of Montana, 1979-2002, and the first known dispersal events leading to a new pack in the Montana population (USFWS unpubl. data). The arrows show the years of the first known dispersals of radio-collared animals into the State of Montana to start a new pack or join an existing pack.

Reproduction. Wolves normally do not breed until at least 22 months of age (Mech 1970). Breeding usually occurs only between the dominant male and female in a pack. In the northern Rockies, the breeding season peaks in mid- to late February (Boyd et al. 1993). Wolves localize their movements around a den site and whelp in late April, following a 63-day gestation period. After the pups are about eight weeks old, they are moved to a series of rendezvous sites. In northwestern Montana, maximum litter size averaged 5.3 (range 1-9) from 1982 to the mid 1990s. By December, average litter size declined to 4.5 (Pletscher et al.1997).

Pup survival is highly variable and influenced by several factors, including disease, predation, and nutrition (Mech and Goyal 1993, Johnson et al. 1994). In northwestern Montana from 1982-1995, 85% of pups survived until December, though survival varied year to year (Pletscher et al. 1997). Pup mortality in the first eight months of life was attributed to human causes (8 of 20 mortalities, 40%), unknown causes (2 of 20, 15%), and disappearance (9 of 20, 45%). In YNP, during the first four years, 133 pups were born in 29 litters and 71% were believed to still be alive in 1998 (Bangs et al. 1998). Pup survival varied between 73-81% from 1996-1998. However, canine parvovirus was strongly suspected as a contributing factor in the low pup survival (45%) in 1999. In 2000, pup survival rebounded to 77% (Smith et al. 2000).

Occasionally, more than one female in a pack may breed, resulting in more than one litter per pack (Ballard et al. 1987). This phenomenon has been documented in YNP (Smith et al. 2000, USFWS et al. 2000, USFWS et al. 2001).

Food Habits. The gray wolf is an opportunistic carnivore and is keenly adapted to hunt large prey species such as deer, elk, and moose. Wolves may prey on smaller species, scavenge carrion or even eat vegetation. In Montana, white-tailed deer, mule deer, elk and moose make up the majority of wolf diets. Ungulate species compose different proportions of wolf diets, depending on the relative abundance and distribution of available prey within the territory. In northwestern Montana, white-tailed deer comprised 83% of wolf kills, whereas elk and moose comprised 14% and 3%, respectively (Kunkel et al. 1999). However, 87% of wolf kills in YNP during 1999 were elk (Smith et al. 2000).

Wolves also scavenge opportunistically on vehicle- or train-killed ungulates, winterkill, and on kills made by other carnivores, particularly mountain lions. Wolves may also kill and feed upon domestic livestock such as cattle, sheep, llamas, horses, or goats. They may also kill domestic dogs but usually do not feed on the carcass.

Movements and Territories. A pack establishes an annual home range or territory and defends it from trespassing wolves. From late April until September, pack activity is centered at or near the den or rendezvous sites, as adults hunt and bring food back to the pups. One or more rendezvous sites are used after pups emerge from the den. These sites are in meadows or forest openings near the den, but sometimes are several miles away. Adults will carry small pups to a rendezvous site. Pups travel and hunt with the pack by September. The pack hunts throughout its territory until the following spring.

Pack territory boundaries and sizes may vary from year to year. Similarly, a wolf pack may travel in its territory differently from one year to the next because of changes in prey availability or distribution, conflict with neighboring packs, or the establishment of a new neighboring pack. Because the attributes of each pack's territory are so unique (elevations, land use, land ownership patterns, prey species present and relative abundance, etc.), it is difficult to generalize about wolf territories and movements.

After recolonizing the GNP area in the 1980s, individual wolves dispersed and established new packs and territories elsewhere in western Montana. Wolves demonstrated a greater tolerance of human presence and disturbance than previously thought characteristic of the species. It was previously believed that higher elevation public lands would comprise the primary occupied habitats (Fritts et al.1994). While some packs have established territories in backcountry areas, most preferred lower elevations and gentle terrain where prey is more abundant, particularly in winter (Boyd-Heger 1997). In some settings, geography dictates that wolf packs use or travel through private lands and co-exist in close proximity with people and livestock. Since the first pack established a territory outside the GNP area in the early 1990s, packs in northwestern Montana negotiated a wide spectrum of property ownerships and land uses. These colonizers also settled across an array of rural development.

With the exception of GNP packs, wolves in northwestern Montana move through a complex matrix of public, private, and corporate-owned lands. (The same is true of newly established packs in other areas of Montana.) Land uses range from dispersed outdoor recreation, timber production, or livestock grazing to home sites within the rural-wildland interface, hobby farming/livestock, or full-scale resort developments with golf courses. Landowner acceptance of wolf presence, and the use of private lands, is highly variable in space and time. Given the mobility of the species and the extent to which these lands are intermingled, it would not be unusual for a wolf to traverse each of these ownerships in a single day. Private land may offer habitat features or concentrations of wintering ungulates that are especially attractive to wolves so the pack may utilize those lands disproportionately more than other parts of their territory. Certain land uses may increase the risk of wolf conflict with humans or livestock.
The earliest colonizing wolves had large territories. Ream et al. (1991) reported an average of 460 square miles (mi^2). In recent years, average territory size decreased, probably as new territories filled in suitable, unoccupied habitat. In the Northwestern Montana Recovery Area during 1999, the average territory size

was 185 mi^2 (8 packs). Individual territories were highly variable in size, with a range of 24-614 mi^2 (USFWS et al. 2000).

Territories in the GYA were larger, averaging 344 mi^2 (11 packs). Individual pack territories ranged from 33 to 934 mi^2. Central Idaho wolf packs had the largest average territory size of 360 mi^2 (13 packs), with individual pack territories ranging from 141 – 703 mi^2 (USFWS et al. 2000).

Dispersal. When wolves reach sexual maturity, some remain with their natal pack while others leave, looking for a mate to start a new pack of their own. These individual wolves are called "dispersers." Dispersal may be to nearby unoccupied habitat near their natal pack's territory or it may entail traveling several hundred miles before locating vacant habitat, a mate, or joining another pack. It appears that dispersing wolves utilize scent-marking behavior and howling to locate other wolves, and frequently use similar travel paths used by previous dispersers. In this regard, habitats occupied by wolves sometime in the past will likely be occupied by wolves in the future, as long as the prey base remains adequate.

Boyd and Pletscher (1999) indicated that the dispersers in their study moved toward areas with higher wolf densities than found in their natal areas – in this case north toward Canada. This has important implications for Montana wolves because there are now resident wolf packs to the south and west in central Idaho and YNP. Dispersal has already resulted in the formation of several new packs in Montana between those core populations (Fig. 2) (Boyd et al. 1995, USFWS et al. 2001). Wolves will probably continue dispersing from the core areas and slowly occupy landscapes between the Canadian border, central Idaho and northwestern Wyoming (USFWS et al. 2000). Ultimately, this will yield a larger regional population, capable of genetic exchange across the international border and northern Rocky Mountains (Forbes and Boyd 1996, 1997).

Boyd and Pletscher (1999) studied wolf recovery in northwestern Montana from 1979 to 1997. Male wolves dispersed at an average age of 28.7 months and traveled an average of 70 mi from their natal territory before establishing a new territory or joining an existing pack. Females averaged 38.4 months old at dispersal and traveled an average of 48 mi. Males and females, combined, traveled an average of 60 mi (range 10 –158 mi). There were two peaks of dispersal: January-February (courtship and breeding season) and May-June.

Increasingly, dispersal is being documented among and between all three recovery areas in the northern Rockies (Bangs et al. 1998, Mack and Laudon 1998, Smith et al. 2000). Combined, there were 21 known dispersal events in 2000 and 19 in 1999 (USFWS et al. 2000). Dispersal paths crossed international boundaries, state boundaries, public and private land boundaries, different land uses, and agency jurisdictions.

Mortality. Wolves die from a variety of causes, usually classified as either natural or human-caused. Naturally caused mortalities result from territorial conflicts between packs, injuries while hunting prey, old age, disease, starvation, or accidents. In an established Alaskan wolf population largely protected from human-caused mortality, most wolves were killed by other wolves–usually from neighboring packs (Mech et al. 1998). However, in the northern Rockies, natural mortality probably does not regulate populations (USFWS 2000). Humans are the largest cause of wolf mortality and the only cause that can significantly affect populations at recovery levels (USFWS 2000). Human-caused mortality includes control actions to resolve conflicts, legal and illegal killings, as well as car/train collisions.

Genetics. In recent years, the application of genetic techniques to the study of wildlife populations has permitted managers to address issues of genetic diversity and population viability with increased confidence. These techniques have yielded information relevant to wolf conservation and management in the northern Rockies. Wolf recovery in the northern Rockies advanced from the combination of

recolonization of northwestern Montana by relatively few wolves from Canada and the reintroduction of wolves into YNP and central Idaho. In northwestern Montana, the founding population was small enough that inbreeding among closely related individuals was possible. Fortunately, the genetic variation among the first colonizers was high (Forbes and Boyd 1996). The combination of high genetic variation among colonizers and ongoing natural dispersal to and from Canadian populations was adequate to assure long-term population viability, provided that genetic exchange continued.

Similar inbreeding concerns existed for the relatively small founding population reintroduced to YNP and central Idaho. But wolves were trapped from two distinct source populations in Canada. The genetic variation among reintroduced wolves (and the source populations from which they came) was also high (Forbes and Boyd 1997). Overall, genetic diversity was similar among samples of natural recolonizers, reintroduced individuals, and the Canadian source populations. Field studies of wolf dispersal and migration distances supported the genetic results (Ream et al. 1991, Boyd et al. 1995, Boyd and Pletscher 1999). Wolf populations in the northern Rockies should not suffer from inbreeding depression.

An underlying tenant of the federal wolf recovery and restoration program is that each state's wolf population is functionally connected so that genetic material can be exchanged among the wolves in the three recovery areas and Canadian wolves. In isolation, none of the three populations could maintain its genetic viability (USFWS 1994a, Fritts and Carbyn 1995).

Population Growth. Wolf populations increase or decrease through the combination and interaction of wolf densities and prey densities (Keith 1983, Fuller 1989). Actual rates of change depend on whether the wolf population is pioneering vacant habitat (as in YNP and central Idaho), whether the population is well established (as in northwestern Montana), and food availability. The degree and type of legal protection, agency control actions, and regulated harvest also influence population trends. Once established, wolf populations apparently can withstand human-caused mortality rates up to about 30% of the fall population (Keith 1983, Fuller 1989).

If protected, low density wolf populations can increase rapidly if prey is abundant. Keith (1983) speculated that a 30% annual increase could be the maximum rate of increase for any wild wolf population. Once densities were high enough, social interactions probably intensify. Conflict and increased competition for food eventually cause a wolf population to level off or decline (Keith 1983, Fuller 1989).

Wolf populations in the GNP area (northwestern Montana and southeastern Alberta) increased an average of 23% annually from 1986-1993 (Fritts et al. 1995). After 1993, the population leveled off (Pletscher et al.1997). Those packs produced dispersers that eventually colonized vacant habitats in western Montana (USFWS unpubl. data). Some packs which formed in the Northwestern Montana Recovery Area since the early 1990s persisted, but others did not. Packs have been lost due to illegal killing by humans, agency control actions where livestock depredation was chronic, and for other unknown reasons.

The average annual rate of increase from 1992 to 2000 in northwestern Montana was 4.7% (USFWS et al. 2001). In 1992, the minimum mid-winter count (including pups) was 41 wolves. Sixty-two wolves were counted in 2000. The highest count was 70 wolves, at the end of 1996. The population grew in some years, but declined in others. Some of the variation probably reflects true changes in wolf numbers, but some variation may be due to decreased monitoring.

Prey populations influenced recent wolf population dynamics in northwestern Montana. White-tailed deer populations expanded from the late 1970s through the mid 1990s, in part precipitating and sustaining increases in wolf numbers and distribution. However, the winter of 1996/97 was exceptionally severe, and white-tailed deer populations declined significantly (Sime, unpubl. data). Other prey populations also

declined and poor recruitment was attributed to winterkill. USFWS believes that the significant decline in natural prey availability led to the record high number of livestock depredations and subsequent lethal control. Wolf depredations on livestock in 1997 alone accounted for 50% of all depredations in northwestern Montana between 1987 and 1999. Smaller prey populations likely translated to decreased wolf pup survival in 1997 and 1998, compared to 1996. Ungulate populations rebounded in recent years and the wolf population is also nearing its 1996 level.

Newly reintroduced wolves in the GYA and central Idaho exceeded all expectations for reproduction and survival (Bangs et al. 1998). Populations became established in both areas within two years, rather than the predicted three to five years. Pup production and survival in the GYA has been high. The average annual growth rate for the GYA from 1996-2000 is 35%, based on the minimum count as of December 31 and including pups (USFWS et al. 2001). However, population growth in the GYA slowed in 1999 after the rapid increase in the first three years post-reintroduction (Smith et al. 2000).

It is likely that population growth rates will slow for both the core Yellowstone and central Idaho populations because of declining availability of suitable, vacant habitat. However, these populations will be a source of founders for new packs outside the YNP and central Idaho recovery areas and within the state boundaries of Montana, Idaho, and Wyoming. Therefore, wolf numbers and distribution outside core areas are expected to increase rapidly in the next few years.

Pack membership typifies the predominant manner in which a wolf exists in the wild. The pack is the mechanism by which wolves reproduce and populations grow. However, in most wolf populations, some lone, nomadic individuals exist as dispersers -- looking for vacant habitat, waiting to be found by a member of the opposite sex within a new home range, or searching for an existing pack to join. Up to 10-15% of a wolf population may be comprised of lone animals.

This is a temporary transition. Wolves in northwestern Montana usually found other wolves in an average of 66 days (range 2-202 days) (Boyd and Pletscher 1999). Occasionally, lone wolves get into conflict with people and/or livestock, ultimately being lost to the population through legal or illegal means. For a wolf to make a contribution to the population, it must affiliate with other wolves. Until they affiliate with a pack, lone wolves are generally counted separately or omitted from total population counts altogether because they do not contribute to population growth and are difficult to detect by routine monitoring activities.

Interactions with Other Species. The relationships between carnivores and other species, and the ecosystems in which they live, could be the most poorly understood and controversial dimension of carnivore ecology (Estes 1996). The real question is not whether carnivores play important, unique roles in the natural functioning of ecosystems, but rather how they go about it, to what degree, and at what scale (Mech 1996).

Some researchers believe wolves could function as a “keystone species,” which exists at relatively low abundance, whose effect on its community or ecosystem is relatively large and involves multiple levels on the food chain (Power et al. 1996, Estes 1996). Despite volumes of published literature on gray wolves, however, there is remarkably limited evidence of the precise nature, degree, and mechanisms by which wolves affect ecosystems.

Wolves kill ungulates, but the effects on ungulate populations are varied. Scavenging species, such as coyotes, common ravens, and wolverines feed on wolf kills. A wide variety of scavengers and other carnivores benefit from carrion being readily available year round, rather than just a pulse in the early spring because of winterkill (Stahler et al. 2001). Wolves may directly or indirectly compete for food with other carnivores (e.g. mountain lion) by selecting similar prey, or by usurping kills (Kunkel et al.

1999, Arjo et al. 2002). Wolves have even been observed harassing grizzly bears in an attempt to take over ungulate carcasses (D. Boyd pers. comm.). Wolves sometimes kill other carnivores, such as mountain lions, coyotes, or grizzly bear cubs (White and Boyd 1989, Boyd and Neale 1992, Arjo 1998, Crabtree and Sheldon 1999, Arjo and Pletscher 1999). Biologists in the GYE have noted social interactions and occasional conflicts between gray wolves and grizzly bears over ungulate carcasses.

Social and Cultural Values

The social, cultural, and aesthetic values people assign to the gray wolf today grow out of a long and colorful history of interactions between wolves and humans. Public opinions about wolves vary greatly. Therefore, a range of alternatives was developed in this EIS to reflect that spectrum.

Early Native American Indians shared the landscape with the gray wolf. The wolf attained a cultural significance to many Indian tribes in Montana. In the days of European settlement and for decades thereafter, wolves were viewed unfavorably because they killed livestock during a period of dramatic declines in native prey populations and continue to do so sporadically today. Wolves were also perceived as a negative, controlling influence on prey populations. However, public opinion about predators and wolves, in particular, evolved through the 1960s and 1970s. For some in society, the gray wolf became a symbol for conservation of wildlife, the environment, and public lands.

Yet, there have been dramatic changes in the landscape since wolves roamed across Montana at the turn of the 20th century. Human settlement, the introduction of livestock and agriculture, and the current abundance and distribution of native ungulates make for a dramatically different landscape for wolves in the 21st century. In part because of these changes, some Montana citizens and organizations spoke out against wolf recovery and restoration efforts in the GYA and central Idaho, as well as against the legal protections afforded wolves by ESA in more general terms (USFWS 1994b). Concerns were expressed about the consequences of wolf depredations on livestock and the associated economic losses, potential loss of flexibility for federal land management agencies, land-use restrictions, impacts to big game populations, and reduced hunting opportunity. Indeed, FWP shared some of those concerns.

When discussing social and cultural implications associated with wolves, the primary affected environment is the values of people living in the presence of a recovered wolf population. A simplification about what drives the differences in attitudes towards wolves might be summed up in a few words: the perceived chance of personal benefit or loss resulting from the presence of wolves. Those who perceive they will benefit (either directly or vicariously) tend to favor wolf presence, and those who perceive a threat of personal loss oppose presence. These differences in values, attitudes, and opinions are clearly reflected in the comments FWP received from the public and account for the spectrum of input on any single issue.

Legal Status and Classification under Montana Statutes

Two Titles within Montana statutes describe the legal status and management framework for wolves. Title 87 pertains to fish and wildlife species and oversight by FWP. Title 81 pertains to MDOL and its responsibilities related to predator control. More recently, the 2001 Montana Legislature passed Senate Bill 163 (SB163), which amended several statutes in both titles. SB163 is included as an appendix in the Montana Wolf Conservation and Management Planning Document (Appendix 1).

The gray wolf remains listed as endangered under the Montana Nongame and Endangered Species Conservation Act of 1973 (87-5-101 MCA). Provisions in SB163, however, automatically remove the

gray wolf from the state endangered species list when it is removed from the federal list. Therefore, separate action to delist the gray wolf under state statute by the Montana Legislature is not required, but FWP would still need to update Administrative Rule 12.5.201, which lists state endangered species.

Once removed from the state endangered species list, the gray wolf will automatically be classified as a species "in need of management." FWP and the FWP Commission will then establish the regulatory framework to manage the species (MCA 87-5-101 to 87-5-123). "Management" is defined in MCA 87-5-102 as:

> "the collection and application of biological information for the purposes of increasing the number of individuals within species and populations of wildlife, up to the optimum carrying capacity of their habitat, and maintaining such levels. The term includes the entire range of activities that constitute a modern scientific resource program including but not limited to research, census, law enforcement, habitat improvement, and education. Also included within the term, when and where appropriate, is the periodic or total protection of species or populations as well as regulated taking."

In Montana statute, "take" means to "harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill wildlife." Thus, through the development of the EIS, FWP and the FWP Commission will establish the management parameters and regulations that limit taking, possession, transportation, exportation, processing, sale, offer for sale, or shipment of wolves. In addition, FWP and the FWP Commission would initiate the law enforcement, population monitoring, educational components, and other elements of a wolf program.

SB163 also amended Montana Statute 87-3-130, which is titled "Taking of Wildlife to Protect Persons or Livestock." This amendment becomes effective only when federal protections are removed. As amended, this statute relieves a person from criminal liability for the taking of a wolf if the wolf is "attacking, killing, or threatening to kill a person or livestock." In addition, "a person may kill or attempt to kill a wolf or mountain lion that is in the act of attacking or killing a domestic dog." The definition of livestock includes ostriches, rheas, and emus. These changes are consistent with the concept of protecting human life and private property (livestock and pets) when they are in imminent danger. Citizens must report any wolves killed or injured in defense of life/property to FWP within 72 hours and surrender the carcass, the pelt, and all wolf parts.

Most importantly, SB163 resolved an element in Montana statute that was a major impediment to establishing the federally-required regulatory mechanisms to guarantee the security and perpetuation of a recovered wolf population. SB163 deleted the gray wolf from the list of species designated as "predatory in nature" which are to be systematically controlled by MDOL (MCA 81-7-101 to 81-7-104). In other words, MDOL will not be required to exterminate wolves upon delisting. Instead, MDOL would control wolves for the protection and safeguarding of livestock, as long as the control action is consistent with a wolf management plan approved by both FWP and MDOL. MDOL and FWP would cooperatively address and resolve wolf-livestock conflicts.

FWP Administration

In the North American model of wildlife conservation, the states have almost sole authority for conservation and management of resident wildlife. The exceptions are for federal trust species (e.g. migratory birds or threatened/endangered species), reserved federal lands (e.g. national parks), and for Indian reservations, as per treaty rights where the tribes maintain wildlife management authority within

reservation boundaries. In Montana, FWP is the agency with the statutory responsibility to manage resident wildlife. FWP's Wildlife Program is coordinated at the statewide level and implemented through seven administrative regions.

The Montana Legislature authorizes staffing with the numbers of Full Time Equivalent employees (FTEs) being adopted with the state budget. Within those programs affected by the outcome of the EIS, current staff includes 97 FTEs in the Wildlife Division, 22 FTEs in the Conservation Education Division, 99 FTEs in the Enforcement Division, 39 FTEs in Field Services, and 97 FTEs in Management and Administration. Outside the Wildlife Division, staff time devoted to support and administration of the wildlife program varies annually, with an estimated 35-40% spent on wildlife related activities. Some of these duties include: enforcement of game laws, licensing and inspection of game farms, responding to game damage complaints and human/wildlife conflicts, meeting public education needs, hunter and bow hunter education, publishing the FWP magazine *Montana Outdoors*, producing educational videos, printing and distributing maps and regulations, conducting drawings for limited permits, issuing special and nonresident licenses, negotiating land acquisitions, developing terms for conservation easements, and tracking expenditures (FWP 1999).

FWP Funding

State law authorizes FWP to collect fees from hunters, trappers, and anglers (87-1-601, MCA). Most of these revenues are channeled back into management of the resources generating it. The Montana Legislature has earmarked about 20% of all license revenues for specific purposes, such as habitat protection or hunter access. The remainder of these funds is deposited into one general license account without regard to the species generating the revenue. Although license revenue could be considered as state revenue, its use is limited to funding FWP programs by law. In order to maintain FWP's eligibility to receive matching federal funding under the Federal Aid in Wildlife Restoration Act (Pittman-Robertson), the Montana Legislature agreed to use hunting license revenue only for wildlife management (87-1-708, MCA). Similarly, use of interest earned from cash balances on license revenue can only be used to fund FWP programs. About two-thirds of the total license revenue collected by FWP is derived from the sale of nonresident hunting and fishing licenses.

The Federal Aid in Wildlife Restoration Act has helped fund FWP's wildlife management programs since 1941 (Kallman 1987). In 2002, approximately 26% ($15.1 million) of FWP's total revenue was obtained from federal sources. Most of this funding is generated through excise taxes on firearms, ammunition, archery equipment, and handguns. Federal funding matches state license revenue to fund wildlife surveys, research, hunter education, and various support functions. Wildlife surveys and inventories and other approved projects typically receive 75% federal funding and 25% state funding from license revenues. Federal funding also was initially used to purchase winter range for big game. Federal law requirements also protect the state's hunting-license revenue from being diverted to uses other than those pertaining to wildlife under the assent acts passed by the Montana Legislature (87-1-708, MCA). Federal law restricts some uses of matching federal funds to exclude some activities such as law enforcement that in turn, must be funded entirely by state hunting, fishing, or trapping license revenue.

Funding sources for the wildlife program include license dollars, matching federal funding, Bonneville Power Administration mitigation trust funds, and private grants and donations. License sale revenues account for approximately 65% of the wildlife program budget. The Wildlife Division received 19% ($11.1 million) of FWP's FY 2002 total budget of $58.8 million. Conservation Education was budgeted $2.5 million, Fisheries $9.6 million, Enforcement $6.4 million, Field Services $7.3 million, and Management and Finance $11.4 (FWP 2002). Budgets are developed internally, with authority to spend funds coming from the Legislature. All budgets are reviewed by the legislative budget committee and

must be approved by both the Montana House and Senate. The FWP Commission also reviews and approves the agency's budget.

Wildlife Resources

Montana's wildlife includes more than 450 species of mammals, birds, reptiles, and amphibians. FWP has statutory responsibility to regulate harvest of 55 wildlife species that are valued for meat, fur, or as "trophies." Many of these species were almost lost in Montana as a result of unregulated exploitation prior to and during settlement in the late 19th and early 20th centuries.

Enforceable wildlife conservation began with the political and financial support from Montana's hunters and anglers early in the 20th century. Early programs emphasized restoring game animals, providing legal protections in state statute, and aggressive predator control. These actions were initiated with public and legislative support and were largely funded by the hunters, anglers, and trappers of Montana. These programs were then, and are now, sustained by a philosophy of public hunting and a funding base from participants. FWP's wildlife program has evolved along with modern scientific principles of wildlife management and is considered one of the leading programs in the nation.

Categories of Wildlife Defined in Montana Statutes

Big Game. Thirteen species of large mammals are defined by statute as game animals, or "big game" (87-2-101 MCA). These include white-tailed and mule deer, elk, moose, and caribou, pronghorn, mountain goat, bighorn sheep, and wild bison. Three species of carnivores/omnivores also are designated as game animals, including the mountain lion, black bear, and grizzly bear. Today, all the above big game species except caribou, bison, and grizzly bear are legally hunted, according to regulations approved by the FWP Commission.

Numbers and distribution of most big game species probably bear little resemblance to pre-settlement conditions. Nearly all big game species were either extirpated or severely reduced in number and distribution through market and subsistence hunting prior to and during settlement. Settlement brought agriculture, forestry, mining, and suppression of catastrophic fires and flooding, causing both subtle and profound changes to Montana's landscape. These changes favored some species and were detrimental to others. Present day populations of white-tailed deer and elk are at their highest levels recorded in recent history. Mule deer numbers fluctuated over the last 20 years, but the statewide population is still robust.

In addition to natural adjustment and recovery by some big game species, efforts to restore self-sustaining populations to all, or portions of, historical ranges have been largely successful. Such efforts included species reintroduction and the acquisition and intensive management of important habitats. In the case of the mountain lion, a change in legal status from a "predator" to a "big game animal" in the early 1970s enabled lion numbers and distribution to increase over the last 30 years. Mountain lions are now present in eastern Montana in sufficient numbers to sustain a legal harvest.

Furbearers. FWP is responsible for management of furbearers (87-2-101, MCA). State law offers protection to ten furbearing species because of the commercial value of their fur. Protection allows for maintenance of sustainable populations while allowing for harvest of prime pelts. Furbearer management has evolved since 1951 when the agency initiated intensive studies on furbearer species throughout the state.

The ten species are: marten, otter, fisher, mink, wolverine, bobcat, lynx, northern swift fox, muskrat, and beaver. Except the northern swift fox and lynx, all these species may be taken by licensed trappers according to regulations approved by the FWP Commission.

Predators. The predator designation is confusing because the term refers to both a legally defined list of animals as well as an ecologically functional group of animals. State law lists the coyote, red fox, weasel, skunk, and civet cat (spotted skunk) as predators (87-2-101, MCA). Ecologically speaking, predators generally kill other animals to secure food. Under this ecological definition, several mammals function as predators but are legally designated as furbearers: bobcat, lynx, wolverine, swift fox, otter, mink, marten and fisher. Others are legally defined as game animals (black bear, mountain lion), nongame wildlife (red fox, raccoon, badger), or threatened and endangered species (grizzly bear, black-footed ferret).

Control of legally classified predators (e.g. coyote, skunk) is assigned to MDOL and carried out by WS. However, WS also controls some game animals (bears and mountain lions) causing livestock damage under a Memorandum of Understanding (MOU) with MDOL and FWP.

Nongame Wildlife, Endangered Species, and Species of Special Concern. FWP's wildlife program has emphasized management of game and furbearer species over nongame. The Nongame and Endangered Species Conservation Act (87-5-101, MCA) expanded FWP's authority in 1973 to include nongame and endangered species. More than 85% of the bird and mammal species in Montana are classified as nongame. FWP has the authority to declare certain nongame species as being "in need of management" and to develop and adopt management plans.

The Montana Natural Heritage Program oversees an ongoing inventory of animals that are rare, threatened, endangered, or believed to be vulnerable to extirpation (Reichel 1996). FWP also maintains a current listing of wildlife species of special concern. The list includes amphibians, reptiles, birds, and mammals and appears in Appendix 2. Of these, seven species are classified as threatened or endangered by federal statute. Montana law does not include a "threatened" status, but four species are listed as endangered under state statute (Appendix 2).

Other. Other statutorily defined wildlife species are classified as Upland Game Birds (grouse, turkey, pheasant, partridge, Section 87-2-101 MCA) and Migratory Game Birds (ducks, geese, swans, doves, snipe; 87-2-101, MCA).

Wolf - Prey Relationships

Montana's recovered wolves are returning to a highly modified environment and a managed system where success, like the success of other major predators like mountain lions and even human hunters, depends on the productivity and perpetuation of deer, elk, and moose populations. As a result, a primary public concern is the effect of predators on prey populations. This EIS cannot provide a comprehensive summary of predator-prey interactions or the effects of wolf predation on ungulate populations. However, some of the scientific literature reviewed for this EIS is included as a partial bibliography in the Montana Wolf Conservation and Management Planning Document (Appendix 1).

All wildlife populations vary through time and across a diversity of habitats and are influenced by a variety of ever changing environmental factors. Published literature on predator-prey interactions is highly varied in its conclusions about the ability of predators to influence prey populations or *vice versa*. There have been nearly as many different interpretations of predator-prey interactions as there have been studies. Predators and prey interact with one another within their unique habitats, through seasonal weather patterns, among an array of species and animal densities, and within different wildlife management frameworks. Each published report, therefore, must be interpreted within the context of the

conditions prevailing at that time and cannot be extrapolated to different locations or ecological systems (National Research Council 1997).

Studies show that predation may influence prey populations through changes in recruitment of young into the adult population, adult mortality, or a combination of both (Gasaway et al. 1992, Ballard et al. 1997, National Research Council 1997, Mackie et al. 1998, Kunkel and Pletscher 1999, Ballard et al. 2001). Research also suggests that increased adult female mortality from other sources, such as hunter harvest or elevated overwinter mortality, may create conditions in which predation limits ungulate populations or slows population growth (Kunkel and Pletscher 1999). On the other hand, some biologists reported that habitat and climate influence deer populations more strongly than wolf predation (Wisconsin Department of Natural Resources 1999). And some Minnesota researchers report that wolves do not appear to impact white-tailed deer populations overall, although wolf predation may have more influence in localized areas and especially in conjunction with severe winters (Mech and Nelson 2000, Minnesota Department of Natural Resources 2001). The impact of severe winter weather is a concern in the West as well. Recent findings in YNP indicate that winter severity has a dominating influence on wolf predation patterns on elk (Mech et al. 2001).

Identifying the factors that drive changes in prey populations and predator-prey interactions is extremely difficult. More than one factor is usually involved, and factors may interact with one another to further complicate efforts to understand their importance. FWP's ungulate management attempts to balance population status, habitat condition, landowner tolerance, hunter opportunity, and an array of environmental factors known to influence populations. Ungulate populations are managed in a comprehensive, ecological way, considering the whole environment, not single factors such as wolf predation or lion predation. Documenting predation as a major limiting factor of ungulate populations requires intensive radio telemetry, manipulation of both predator and prey populations, measurement of environmental conditions, a well designed monitoring program, and a sustained long-term effort. Systems with multiple large predators, including wolves, are even more challenging. FWP's current understanding of how ungulates, wolves, other carnivores, and their physical environments interact in Montana will improve with time through monitoring and research, such as the ongoing intensive studies in southwestern Montana and YNP. Management improves as a result.

Because of their long-term financial investments and willingness to impose hunting regulations to best conserve wildlife, Montanans now enjoy relatively liberal hunting opportunity for more ungulate species than other western states. This is evident in long-term trends in hunter numbers and harvest for both elk and deer (Figures 5-8). Statewide, the number of elk hunters and elk harvest has gradually increased since the 1960s. This reflects the increasing interest in elk hunting as elk populations increased and expanded into formerly elk-free habitats. Long-term trends for deer are more volatile and reflect real changes in deer abundance and corresponding changes in hunter opportunity due to changes in hunting regulations. At the FWP regional scale and the individual hunting district level, the long term trends are more variable.

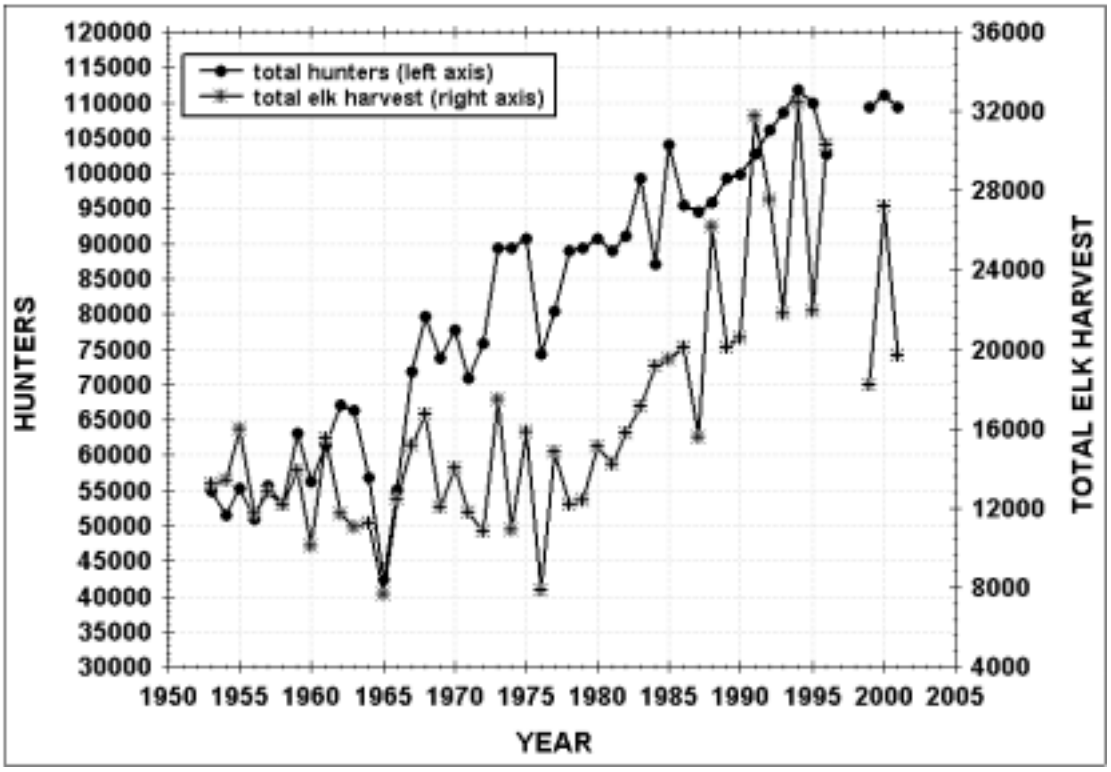

Figure 5. Total number of elk hunters and total elk harvest in Montana, 1954-2001.

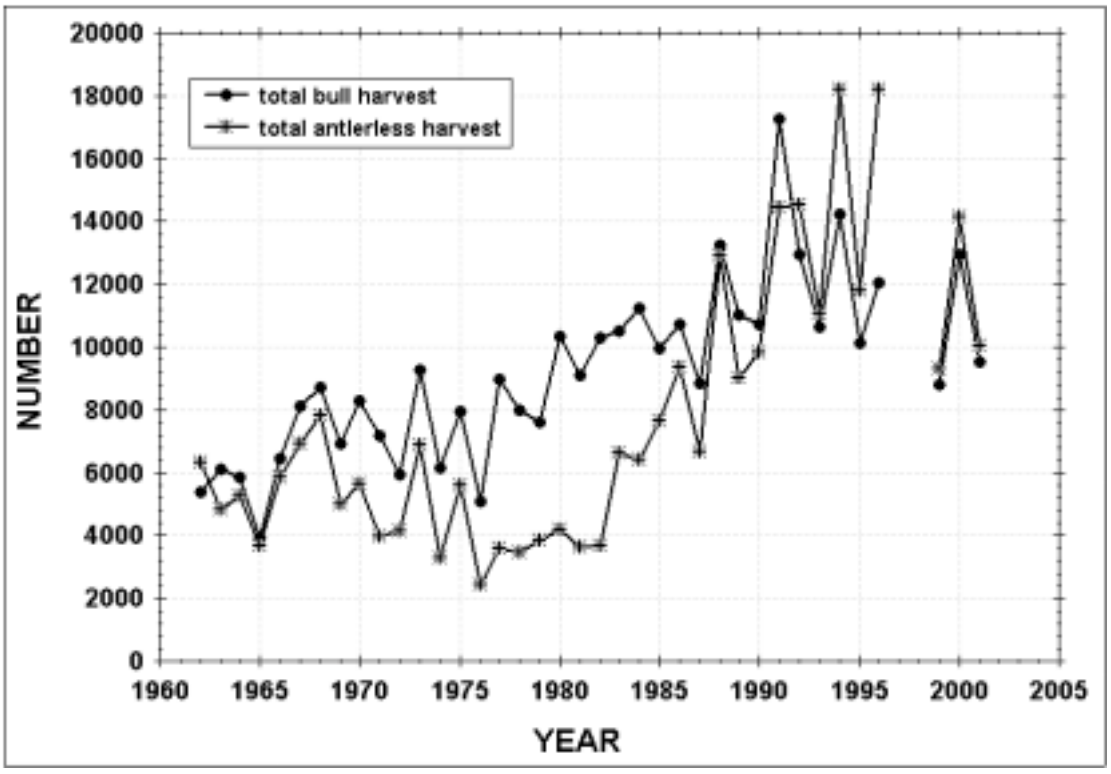

Figure 6. Total bull elk and antlerless elk harvest in Montana, 1960-2001.

Figure 7. Total deer harvest for white-tailed deer and mule deer combined 1960-2001 and total number of deer hunters in Montana, 1985-2001.

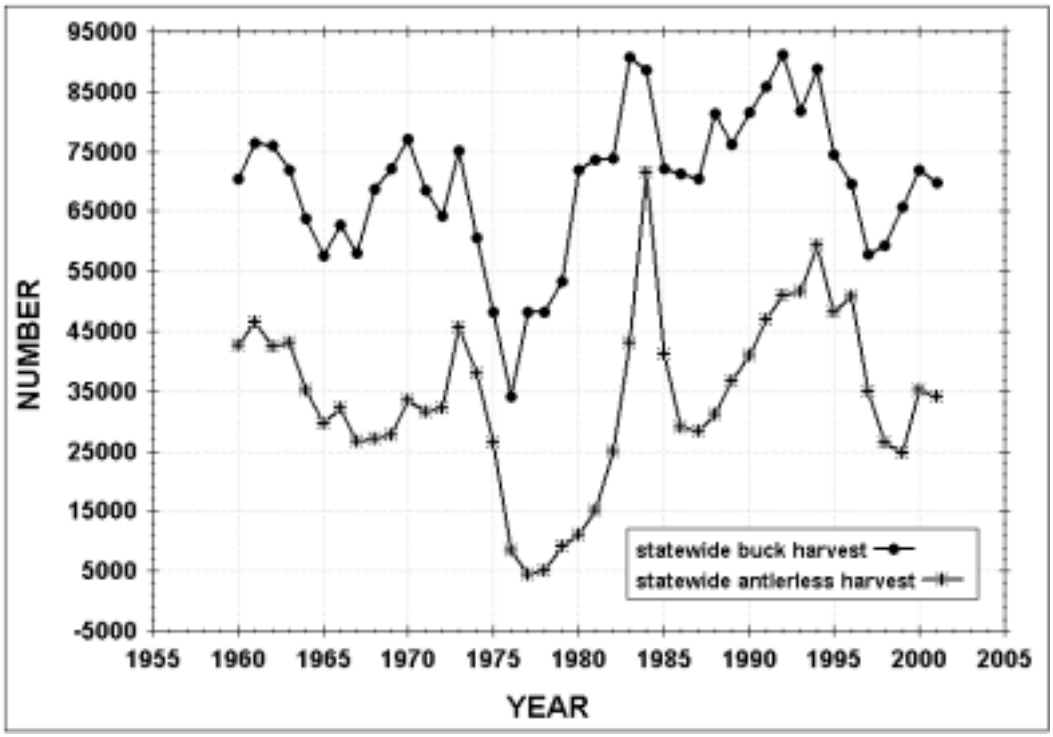

Figure 8. Total buck and total antlerless harvest for white-tailed deer and mule deer combined in Montana, 1960-2001.

Wildlife Habitat

Montana's diverse landscape can be described as six ecosystems based on topography, climate and vegetation (Table 2). The gray wolf is a habitat generalist and historically occurred across all vegetation types in Montana where there was adequate prey. Hence, current day wolf habitat will be defined more specifically by ungulate distribution and human settlement patterns.

A keystone of FWP's habitat conservation efforts is Habitat Montana. This program focuses on land conservation initiatives that benefit wildlife and maintain other natural resource values of private lands. FWP administers a network of Wildlife Management Areas (WMAs) that are managed to benefit wildlife (wintering ungulates in particular) and to provide opportunities for public recreation. These lands are purchased using earmarked revenue collected from the sale of hunting licenses and matching federal revenues. Vegetation management objectives on many of them are met in part by livestock grazing through cooperative agreements with adjacent landowners. FWP also participates in numerous federal habitat conservation programs, such as a Forest Legacy (USFS) and Habitat Conservation Plans (USFWS).

Table 2. Six major ecosystems of Montana based on topography, climate and vegetation.

Ecosystem	Topography	Predominant Vegetation	Climate
Montane Forest	Mountainous	Forest, usually conifer dominated	Maritime in northwestern Montana; continental in southwest Montana
Intermountain Grassland	Intermountain valleys and foothills	Grasslands or agriculture	Continental
Riparian	Gentle to mountainous; adjacent to surface water (lakes, rivers, wetlands etc.)	Various; when forested, dominant tree/shrub cover is deciduous	
Shrub Grassland	Level, gently rolling; locally steep in the mountains; dissected river breaks	Shrubs dominate; deciduous trees or shrubs in wetter areas	
Plains Grassland	Generally flat to rolling; badlands; glaciated in the north	Shortgrass prairie, prairie badlands; agriculture	Semiarid; cold winters, warm summers; highly variable
Plains Forest	Uplands in plains areas; dissected; moderately steep	Forest, usually conifer	

Plant Species of Special Concern

Montana supports a rich diversity of plant species. The Montana Natural Heritage Program has identified 365 species of vascular plants that are of special concern in the state (Heidel 1996). The term "special concern" is applied to plant species that could be reduced in number by land management to the point where they would be listed as threatened or endangered. USFWS is responsible for listing threatened and endangered plant species that require protection under the federal ESA.

Noxious Weeds

Introduced plant species often aggressively colonize sites where native vegetation and soils are disturbed. When these plants conflict with, interfere with, or otherwise restrict land management, they are commonly referred to as weeds. A plant that has been classified as a weed, such as leafy spurge or spotted knapweed, only attains a "noxious" status by an act of state legislation. Noxious weeds are classified in one of three categories (Appendix 3).

Land Management

Travel/Access Management

Responsibility for managing human access and travel on public lands resides with the administering land management agency, whether state or federal. Human access can be managed by time period (e.g. seasonal closures) or by localized area restrictions. FWP closes most WMAs to human access during the winter period to prevent disturbance to wintering ungulates. Outside of Yellowstone and Glacier national parks, USFS manages most federal lands utilized by wolves. Habitat, access and motorized travel are managed to meet resource objectives or legal requirements. Presently, there are no restrictions on road use or road-density on USFS or U.S. Bureau of Land Management lands due solely to the presence of wolves. NPS generally restricts motorized travel to paved routes only, while foot/horse travel is permitted most places. Foot travel is occasionally restricted due to seasonally imposed closures in areas of concentrated wildlife activity. While FWP continues to consult with land management agencies or private landowners about access and travel management, FWP has no legal authority to implement access or travel restrictions on land it does not manage. Instead, FWP works cooperatively with land managers to meet shared objectives.

Connectivity

Connectivity implies that wolves inhabiting the Northern Rocky Mountain Recovery Area in each of the three states are functionally connected through emigration and immigration events, resulting in the exchange of genetic material between sub-populations. This functional relationship is consistent with the biological intent of the original northern Rockies recovery plan and is an underlying prerequisite for successful, long term wolf recovery in the northern Rockies. Designating critical habitats or establishing travel corridors were not necessary to successfully recover the gray wolf in the northern Rockies. During the recovery phase, connectivity of the wolf population in the northern Rockies with the Canadian population was assured through legal protections, adequate prey populations, and the network of public lands – all of which facilitate dispersal and maintenance of genetic viability.

Sufficient dispersal and exchange of wolves between the three sub-populations in the future will be necessary to maintain the high degree of genetic variation of a regional wolf population. In isolation, none of the three recovered populations could maintain its long term genetic viability (USFWS 1994a). Isolation is unlikely if populations remain at or above recovery levels and regulatory mechanisms prevent chronically low wolf numbers or minimal dispersal (Forbes and Boyd 1997).

Connection between the U.S. and Canadian wolf populations is also an important underpinning of long term wolf recovery. Montana is an important link between Canadian wolves and wolves in YNP, Wyoming, and central Idaho. Canadian packs will likely continue to be a source of wolves dispersing into the U.S. while some U.S. wolves will disperse into Canada. Dispersal events across the international border will contribute to genetic diversity and provide an added measure of long term security for populations in both the U.S. and Canada.

Wolf Den and Rendezvous Sites

Wolves respond differently to human disturbance (Claar et al. 1999). Differing responses are due to a variety of factors, including the individuality of wolves, the specific setting, and whether the population is exploited or protected (Ballard et al. 1987, Mech et al. 1998, Thiel et al. 1998). In some studies, wolves moved pups after human disturbance, but pup survival was not affected (Ballard et al. 1987). It also appears that pups were not moved over long distances (Thiel et al. 1998).

Wolf activity on national forest lands in Montana generally hasn't prompted area closures or travel restrictions specifically because recreational use of these lands is often dispersed and sporadic. In national parks, area closures around den or rendezvous sites are sometimes implemented because of the strong public desire to view wolves and high visitation in the areas with wolf activity during the denning period. Areas around dens in YNP are closed until June 30. GNP established a seasonal closure area in the North Fork for one wolf pack since 1995 and has a framework for addressing future wolf activity. Ultimately, land management agencies may adopt seasonal or area restrictions independently from FWP.

Economics / Livelihoods

A number of economic resources or values could be affected if FWP assumes management responsibilities for the gray wolf. The following description is based on the most current information available on livestock depredation by wolves, big game hunting and outfitting, regional economic activity, cultural and social values, recreation, and FWP license revenues. The most detailed information available is specific to the GYA and southwestern Montana due to the in-depth analyses required prior to the reintroduction of wolves to YNP and central Idaho. Information is also available from northwestern Montana where wolves have been present since the mid-1980s, and statewide information is also presented.

Livestock Depredation

A concern about wolf recovery is the potential for wolves to stress, injure, or kill livestock (primarily cattle and sheep), guarding animals, or other domesticated animals such as llamas. Financial losses may result directly from wolf depredation whether confirmed or not, and indirect financial losses may accumulate because of increased management activities or changes to agricultural operations. These financial hardships accrue to individual farmers and ranchers and may be significant to them.

Tables 3 and 4 show total annual Montana cattle and sheep inventories and death losses from all causes since 1990. Cattle and calf inventories in the state have remained relatively stable at about 2.5 million animals. During this period, sheep inventories have declined significantly from over 650,000 to nearly 400,000 animals. While there has been significant variation in death losses for both cattle and sheep over this period, both species have seen losses in excess of 50,000 animals per year for predator and non-predator losses combined.

Currently, the Montana staff of WS investigates and records all reported wolf kills of domestic livestock or pets. Table 5 summarizes the Montana WS wolf depredation control program from 1997-2002, reported according to federal fiscal years. To date, nearly all depredation incidents investigated by WS within Montana occurred on private land, whereas over 80% of depredations in Idaho and about 50% of depredations in Wyoming were on public grazing allotments (Meier 2001). As wolf numbers and distribution increase in Montana, depredations may also increase on public lands. Between 300,000 and 400,000 sheep and cattle graze summer pasture on public lands in Montana (Bangs and Shivik 2001). Wolves don't necessarily depredate on livestock whenever livestock are encountered, but it is evident that

wolf packs that regularly encounter livestock will depredate sporadically (Bangs and Shivik 2001). Field observations have also indicated that even though an individual wolf or pack may not necessarily injure or kill livestock, livestock can become distressed and agitated when wolves are in the area and sometimes injure themselves in fence lines or on agricultural equipment. Overall, livestock losses appear related to the availability of wild prey, increasing pack size, and the learned behavior of individual wolves.

Table 3. Cattle and calf inventory, value per head, and death losses in Montana from all causes 1990-1999 (Montana Agricultural Statistics: October 1999, p. 146, information on January 1.).

Year	Total Cattle and Calf Inventory (animals)	Value per Head ($)	Total Animal Death Losses
1990	2,250,000	675	84,000
1991	2,650,000	755	65,000
1992	2,550,000	720	68,000
1993	2,500,000	760	65,000
1994	2,550,000	780	77,000
1995	2,700,000	675	70,000
1996	2,750,000	560	80,000
1997	2,700,000	600	100,000
1998	2,600,000	740	127,000
1999	2,600,000	660	82,000

Table 4. Annual predator losses (all species combined) and non-predator losses of sheep and lambs (number of head) in Montana, 1990-1998, (Montana Agricultural Statistics: October 1999, pp. 150-51).

Year	Jan 1 Sheep and Lamb Inventory	Predator Losses	Non-predator Losses
1990	663,000	39,100	79,900
1991	683,000	44,900	83,500
1992	678,000	41,200	63,000
1993	564,000	40,200	59,400
1994	534,000	42,900	53,800
1995	490,000	37,100	46,900
1996	465,000	31,200	39,200
1997	432,000	27,000	49,100
1998	415,000	21,800	38,700

Figures 9 and 10 display the number of confirmed cattle and sheep depredations by wolves in Montana since wolves first started recolonizing Montana in the mid-1980s. The number of wolf depredation incidents generally increased as wolves increased in number and distribution, with some variation from one year to the next. During 1999-2001, an average of 15 cattle and 27 sheep per year were confirmed as

wolf kills. This level of loss is <0.5% of the total death losses for cattle and sheep, respectively, in the state. However, as indicated above, these losses accrue to individual producers and only represent dead livestock that were confirmed killed by wolves. There were no confirmed cases of wolves killing dogs or llamas until 1995. Figure 11 displays confirmed dog and llama losses from 1995–2001.

WS field investigation reports summarize the evidence examined and confirm if wolves were the cause of livestock injury or death. Up until recently, Montana WS personnel did not officially categorize "probable" or "possible" wolf losses. However, these types of losses are now incorporated into field investigative procedures. The number of confirmed wolf-caused losses is expected to underestimate total livestock losses due to wolves because of insufficient evidence, lack of a carcass, or carcass visitation by more than one predator. The potential for unconfirmed and/or undocumented losses is problematic for individual livestock producers because unconfirmed losses are not covered by Defenders of Wildlife, a non-governmental conservation organization which has reimbursed owners for confirmed livestock losses through its privately funded compensation trust fund. It can also be problematic for livestock producers if losses are categorized as probable, because the Defenders of Wildlife compensates probable losses at 50% of the market value.

One study in Idaho examined interactions between wolves and domestic calves within the USFS Diamond Moose Grazing Allotment in central Idaho to evaluate the role of wolf predation on calf survival and movements (Oakleaf 2002). However, in Montana, there are limited sources of information available about wolf-cattle interactions in order to estimate the potential extent of unconfirmed wolf losses. WS investigative reports of wolf complaints may provide some insight. Table 6 indicates the number of domestic animals investigated, but not verified killed or injured by wolves. Some of these animals suffered injuries or death for reasons that, according to the WS agent conducting the investigation, were not wolf related while others may have been injured or killed by wolves, but the evidence is not sufficient to confirm it truly was a wolf.

WS field investigative reports of wolf-related complaints were reviewed for the calendar years 1999-2001 (WS unpubl. data). Those incidents which were noted as obviously caused by something else (e.g. noxious weeds or lightening) were not considered further. The remainder of the investigations that were officially unconfirmed as wolf-caused were tallied as "potential" wolf losses for the purposes of this EIS. Examples of investigative conclusions for "potential" wolf losses were "scavenged" or "undetermined." Defenders of Wildlife payment records were cross referenced to ensure that these "potential" losses were not compensated as "probable" wolf losses. Table 6 summarizes those livestock losses that were officially unconfirmed as wolf-caused by WS, but may have potentially been caused by a wolf. Because the public identified unconfirmed losses as an issue, these data will also be used to estimate economic losses due to unconfirmed losses (see Chapter 4). While even these data probably underestimate actual losses, they are the best available data for Montana at the present time.

Since 1987, Defenders of Wildlife (a conservation organization) has administered a wolf compensation trust to reimburse ranchers in the northern Rockies for confirmed livestock losses caused by wolves. Table 7 shows total payments since 1987. Payments are depicted by state boundary for Montana, Idaho, and Wyoming, irrespective of federal wolf recovery area boundaries. These payments may not fully compensate ranchers for their wolf-related losses to the extent that depredation is underestimated, and to the extent that ranchers incur indirect costs related to wolves such as fence repair and additional costs of managing livestock – wildlife interactions. Economic impacts of confirmed and "potential" livestock losses are addressed in Chapter 4.

Table 5. Summary of the number of wolf-related complaints received and investigated by the U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services Wolf Depredation Control Program in Montana 1997-2002, according to federal fiscal years (October 1 – September 30). Source: U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, Montana Field Office.

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002 through 7/12/02
Date of first depredation	10/1/96	10/4/97	12/23/98	10/3/99	10/4/00	10/8/01
Total complaints received	40	39	56	55	36	45
Complaints involving livestock	40	39	56	55	36	43
Total complaints verified	13	15	20	19	20	25
Verified complaints involving livestock	13	15	20	19	20	23
Percent of total complaints verified	32.5%	38.4%	36.0%	36.0%	56%	55.5%

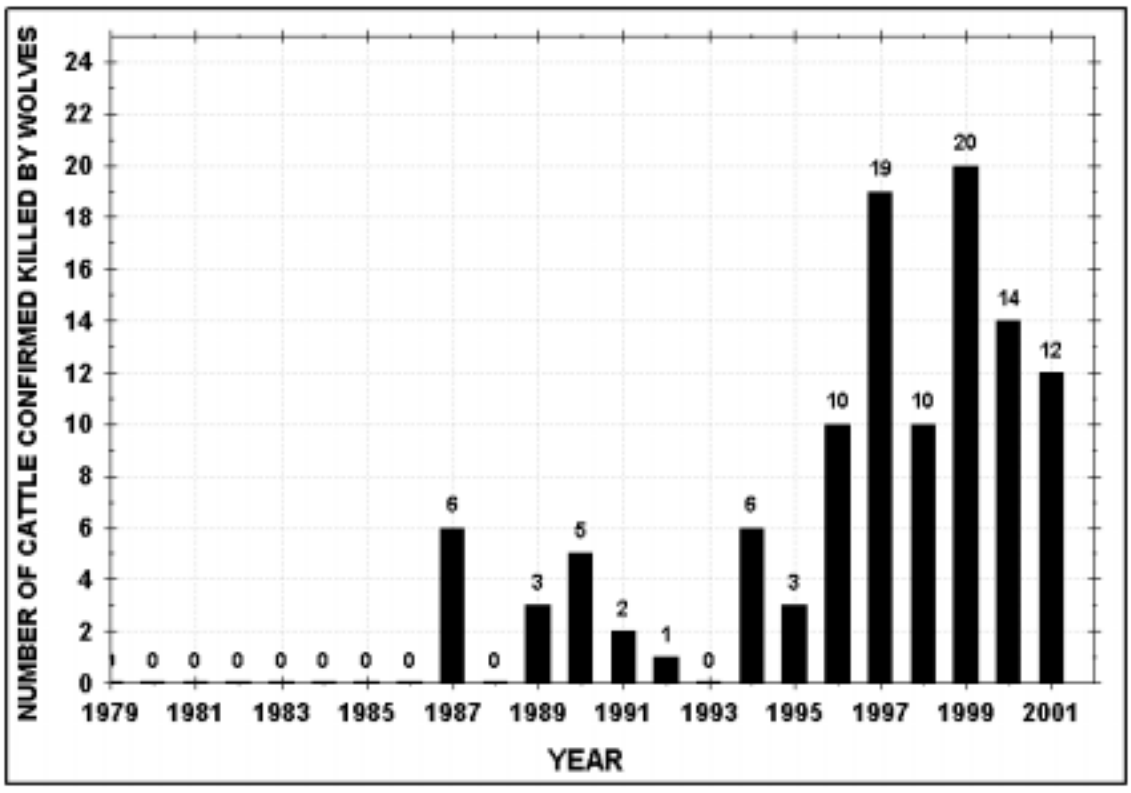

Figure 9. Number of cattle depredations confirmed by Wildlife Services as wolf-caused in Montana, 1980-2001 (USFWS unpubl. data).

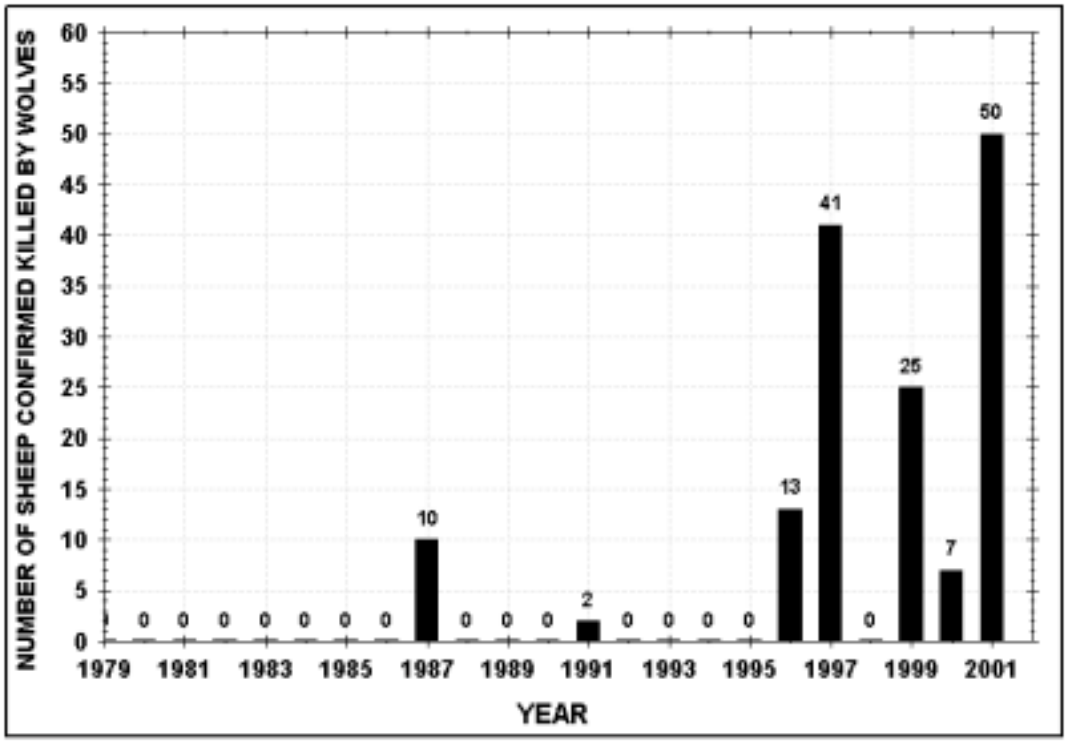

Figure 10. Number of sheep depredations confirmed by Wildlife Services as wolf-caused in Montana, 1980-2001 (USFWS unpubl. data).

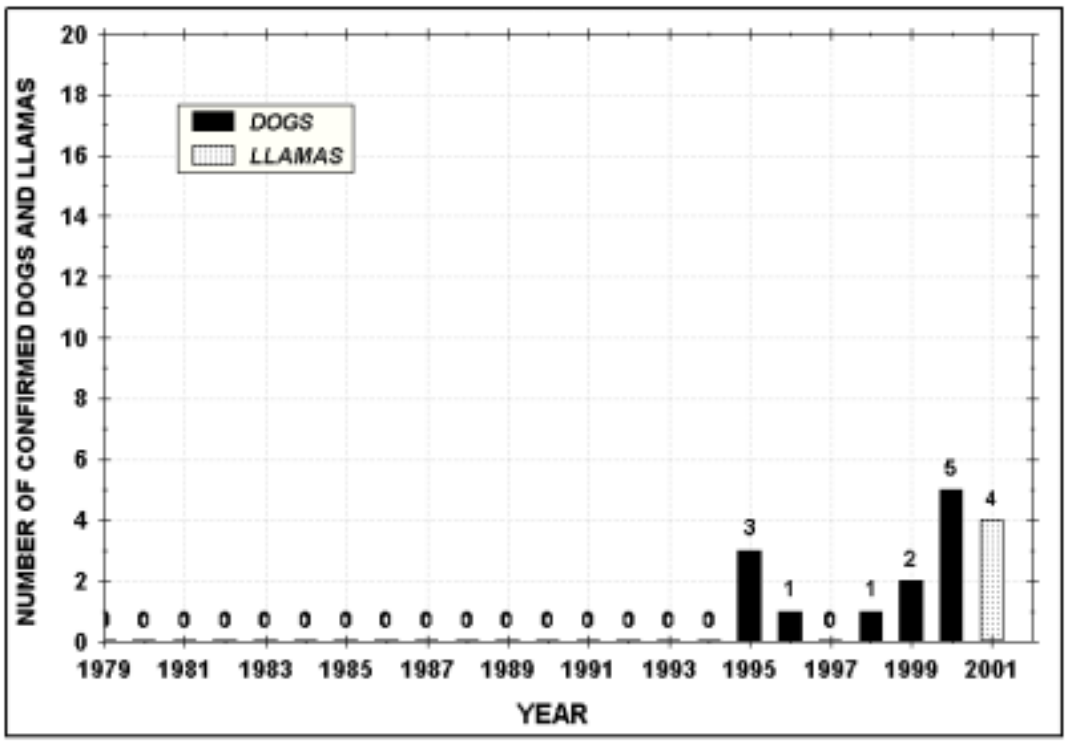

Figure 11. Number of domestic dogs and llama depredations confirmed by Wildlife Services as wolf-caused in Montana, 1980-2001 (USFWS unpubl. data).

Table 6. Livestock losses that were unconfirmed as wolf-caused by Wildlife Services but that could have potentially been caused by wolves, given that the investigation did not document any obvious cause of death or injury such as noxious weeds or lightening, during calendar years 1999-2001 (Wildlife Services, unpubl. data).

Potential Wolf-caused Losses	Calendar Year 1999	Calendar Year 2000	Calendar Year 2001
Cattle	11	8	6
Sheep	2	1	1
Horse/colt	1	3	1
Dog (herding or guarding)	0	2	0

Big Game Hunting

Hunting in general, and especially for big game, is an important activity for many Montana residents. For some hunters, wild game is a primary source of food for the family table. The 2001 National Survey of Fishing, Hunting, and Wildlife-associated Recreation found that residents spent over two million days hunting within the state in 2001 (USFWS and U.S. Department of Commerce 2002). Additionally, 97% of residents' total hunting days in 2001 were spent hunting within the state. Of all hunting opportunities, elk and deer hunting are some of the most highly valued, both in terms of total days spent hunting, and total expenditures by resident and non-resident hunters within the state. The number of elk hunters and hunter days in Montana has increased steadily through time (Figure 12). The number of hunters and hunter days are more variable for deer (Figure 13). Compared to deer and elk, opportunities to hunt moose are limited, but they are highly sought primarily by residents (Figure 14). Hunter success and total harvest vary, sometimes significantly, from year to year. Fluctuations are primarily due to hunting conditions during the season, changes in general regulations and antlerless opportunity, hunter access, changes in population status, and hunter success in previous seasons are also influential.

Big game hunters in Montana are concerned about the potential for big game population declines and subsequent declines in hunter opportunity due to wolf predation on ungulates. Hunters in Montana enjoy greater opportunity now than even 20 years ago. Since 1990, the hunting regulations, thus, hunter opportunity, for antlered males have been relatively consistent for deer and elk. In recent years, more specialized regulations were adopted to provide opportunities for larger-antlered, mature males for mule deer and elk in certain hunting districts. Hunter opportunity for antlerless elk has also been relatively stable statewide. The number of permits at the individual hunting district level varies through time. Opportunity has significantly increased in some localized areas consistent with management objectives to reduce elk populations through the expanded use of A-7 antlerless elk licenses in conjunction with antlerless elk permits. In other localized areas, antlerless elk opportunity has declined. Hunter opportunity for antlerless deer reflects a number of factors, including deer population status, fawn recruitment trends, and management objectives. The long term trend in the number of moose permits available is relatively stable, with the greatest fluctuation in FWP Region 1 (Table 8).

FWP used data collected through the telephone harvest survey to examine long term trends in elk and deer hunting participation at the FWP regional scale. Data from 1990-2001 were divided into two time periods (1990-94 and 1995-2001) to correspond to increasing numbers of wolves in northwestern Montana and wolf reintroduction into YNP and central Idaho. Significant events also occurring in that

time span include the severe winter of 1996/97, large summer forest fires, especially favorable hunting conditions in 1994, an overhaul of mule deer management, and other smaller regulation changes. The methods used to estimate hunter numbers changed in 1996, so the data for 1990-94 may be slightly over-estimated compared to 1995-2001. The average the number of elk hunters and the average number of elk hunter days in the early 1990s was about the same as the late 1990s (Figures 15 and 16). Although the exact number changes from year to year, there are no trends upward or downward. The number of deer hunters and deer hunter days is much more variable year to year. The long term averages are also variable and are generally lower in the late 1990s compared to the early 1990s across most FWP regions (Figures 17 and 18). This likely reflects real declines in mule and white-tailed deer populations due to environmental events and the resultant changes in regulations, particularly for mule deer. Hunter participation is affected by a host of factors beyond just the presence of a recovered wolf population.

The diet of gray wolves in Montana is expected to be primarily white-tailed deer, mule deer, elk and moose. While other ungulate species or small mammals may also be taken, they are expected to be a minor portion of the total diet. The actual proportion of whitetail and mule deer, elk, and moose will vary in part based on prey availability and relative prey vulnerability. In northwestern Montana (FWP Region 1 and a portion of Region 2), wolves are expected to prey primarily on white-tailed deer, elk, and moose (Kunkel 1999). The white-tailed deer is the primary ungulate species sought by human hunters as well. Figure 19 shows long term trends in FWP Region 1 white-tailed deer hunting. Figure 20 shows long term trends in FWP Region 1 elk hunting.

Table 7. Payment from the Defenders of Wildlife Bailey Wildlife Foundation Wolf Compensation Trust Fund (rounded to nearest dollar) for confirmed livestock losses or injuries caused by wolves, 1987-2001, in Montana, Idaho, and Wyoming (see www.defenders.org/wolfcomp.html).

Calendar Year	Montana	Idaho	Wyoming
1987	$3,049		
1988	none		
1989	$1,730		
1990	$4,700		
1991	$1,250		
1992	$374		
1993	none		
1994	$2,322		
1995	$1,633	none	None
1996	$3,506	$3,977	None
1997	$16,495	$3,761	$12,434
1998	$4,810	$6,380	$500
1999	$12,063	$15,794	$4,975
2000	$7,935	$24,773	$14,339
2001	$21,274	$9,627	$17,454
Total, all years	$81,141	$64,312	$49,684
Average per year since reintroduction (1995-2001)	$9,674	$9,187	$7,098

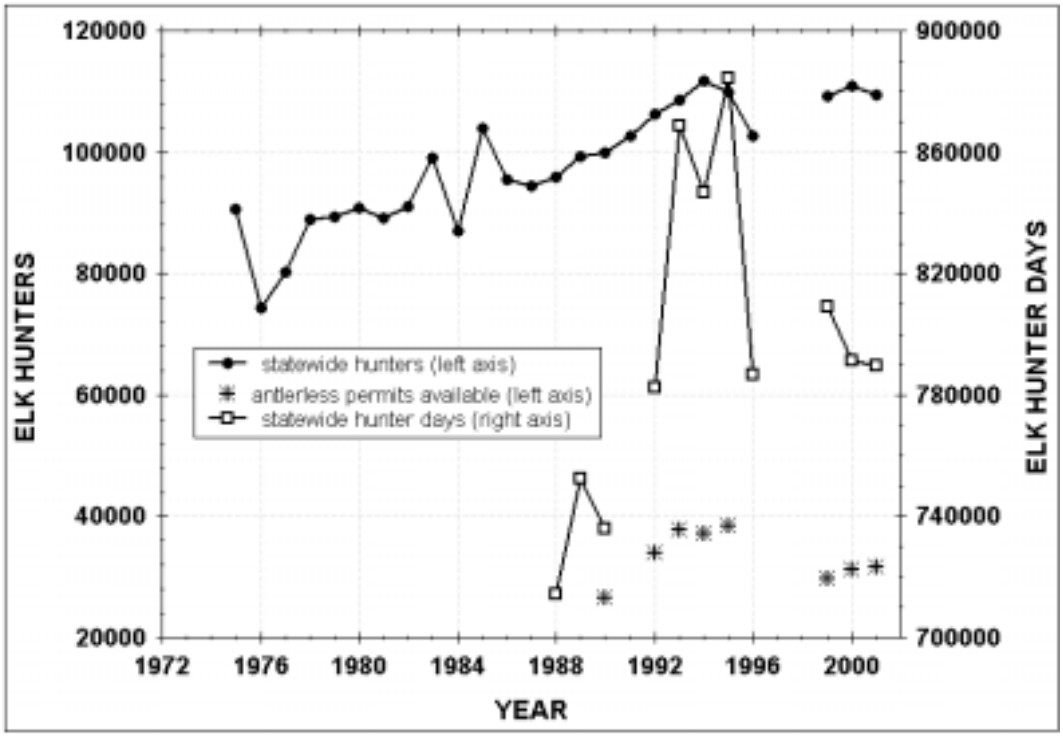

Figure 12. Total number of elk hunters, elk hunter days, and number of antlerless permits available in Montana, 1975-2001.

Figure 13. Total number of deer hunters and total hunter days for white-tailed deer and mule deer combined in Montana, 1987-2001.

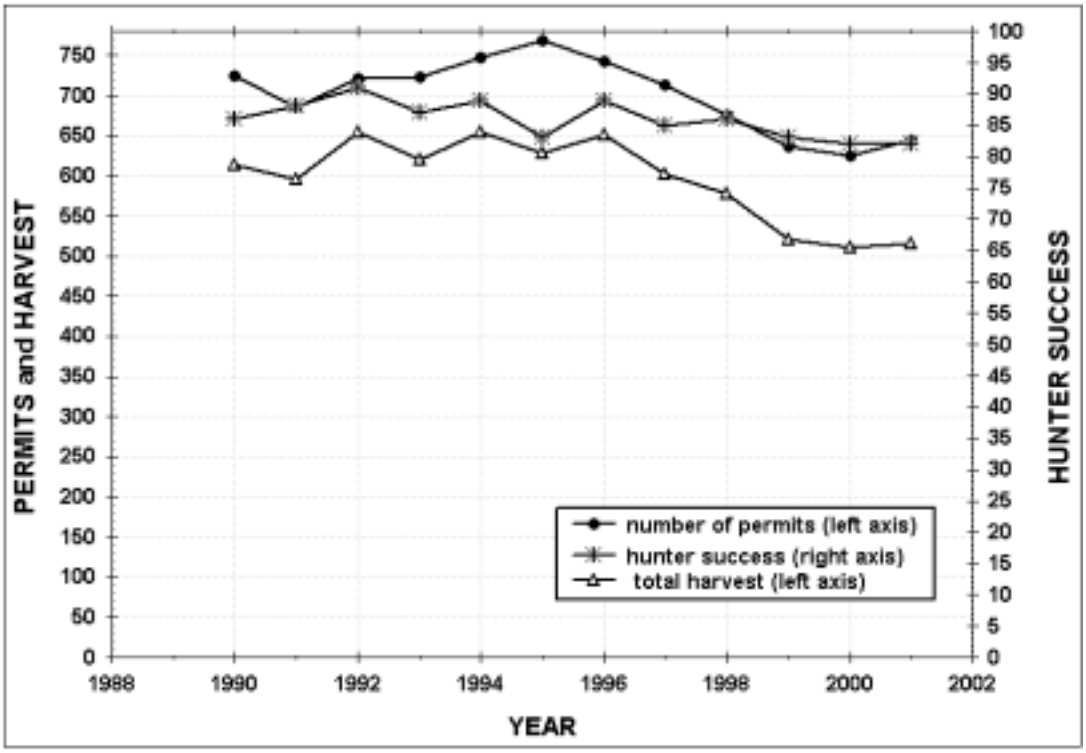

Figure 14. Total number of moose permits available, hunter harvest, and moose hunter success in Montana, 1990-2001.

Table 8. Average number of moose permits available in Montana Fish, Wildlife & Parks Regions 1-5 for 1995-2001. One standard deviation from the average (an indicator of how much the actual number varies through time) is shown in parentheses.

Montana Fish, Wildlife & Parks Region	Average Number of Permits (+/- 1 standard deviation)
Region 1	190 (+/- 59)
Region 2	75 (+/- 6)
Region 3	373 (+/- 12)
Region 4	10 (+/- 2)
Region 5	36 (+/- 4)

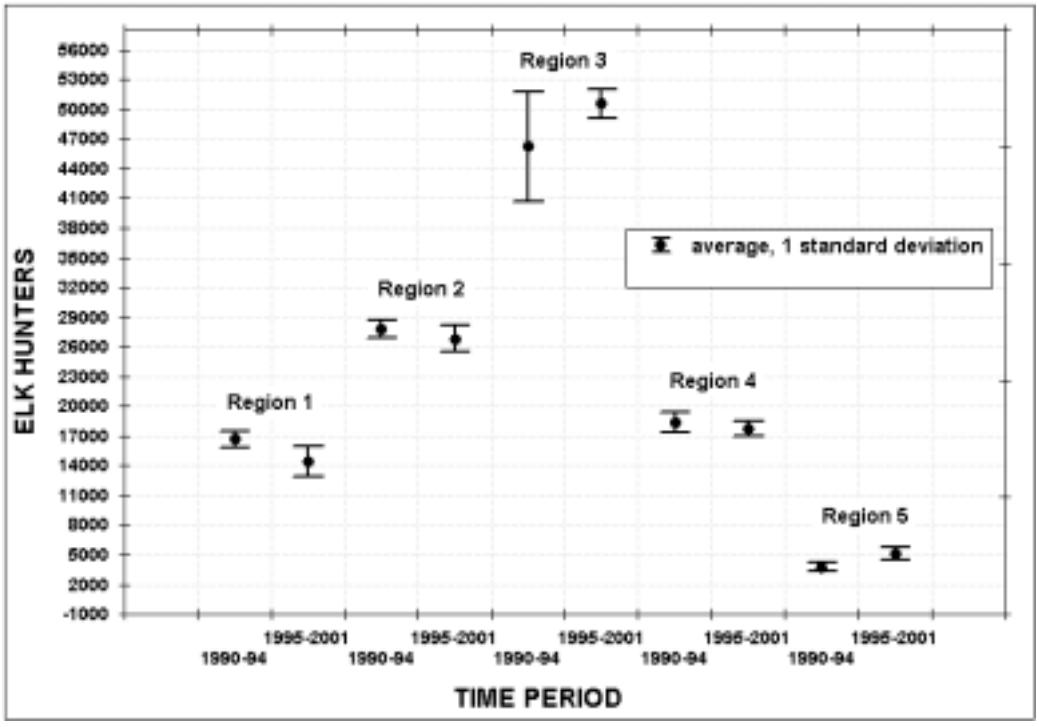

Figure 15. Average number of elk hunters for Montana Fish, Wildlife & Parks Regions 1-5 for two time periods 1990-1994 and 1995-2001. Standard deviation (an indicator of how much the actual number varies through time) brackets the average.

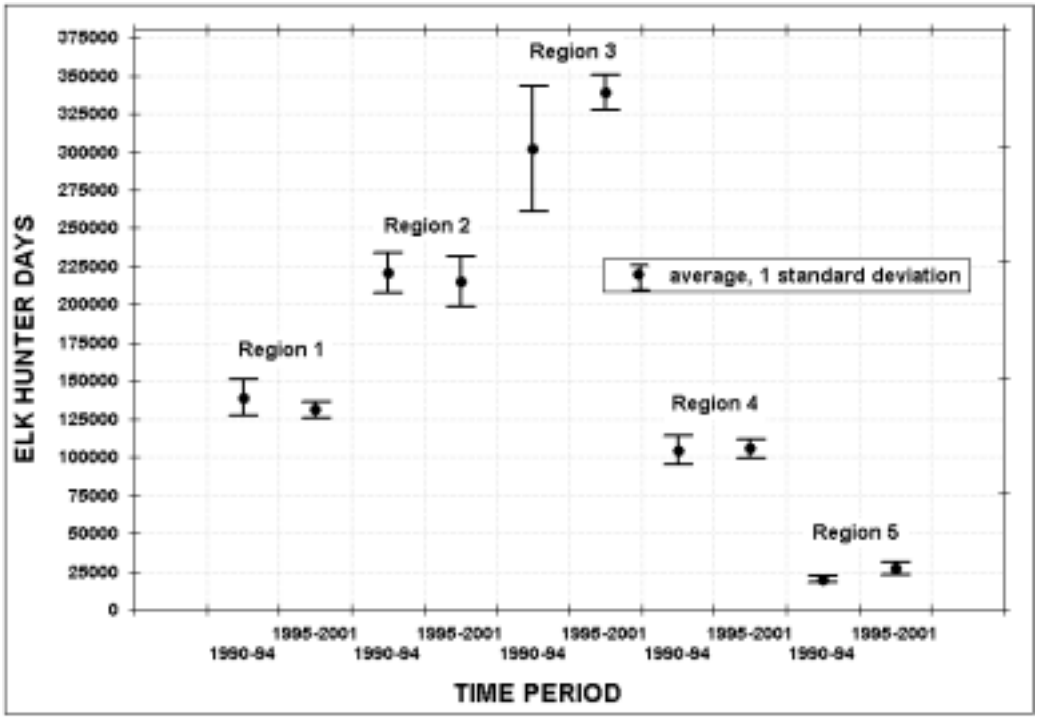

Figure 16. Average number of elk hunter days for Montana Fish, Wildlife & Parks Regions 1-5 for two time periods 1990-1994 and 1995-2001. Standard deviation (an indicator of how much the actual number varies through time) brackets the average.

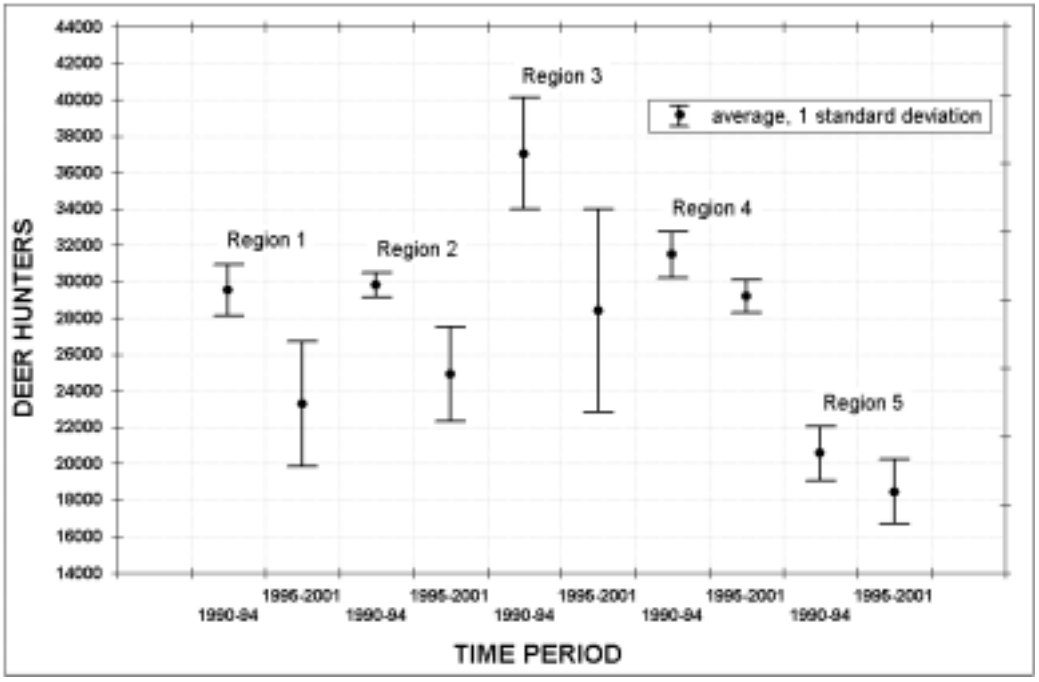

Figure 17. Average number of deer hunters for Montana Fish, Wildlife & Parks Regions 1-5 for two time periods 1990-1994 and 1995-2001. Standard deviation (an indicator of how much the actual number varies through time) brackets the average.

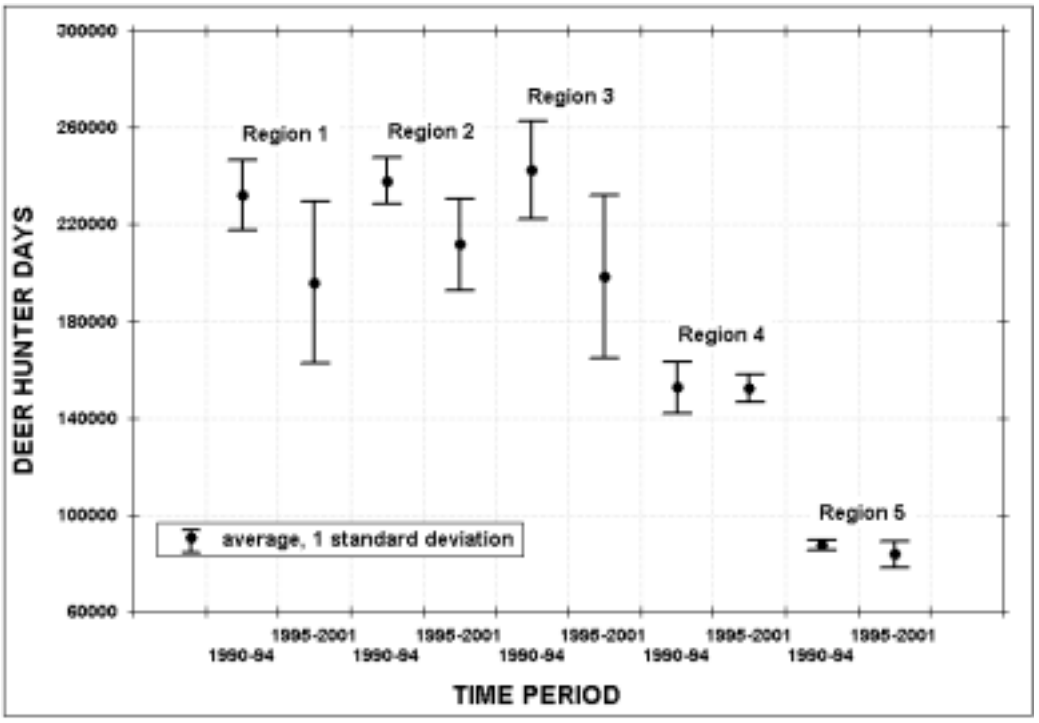

Figure 18. Average number of deer hunter days for Montana Fish, Wildlife & Parks Regions 1-5 for two time periods 1990-1994 and 1995-2001. Standard deviation (an indicator of how much the actual number varies through time) brackets the average.

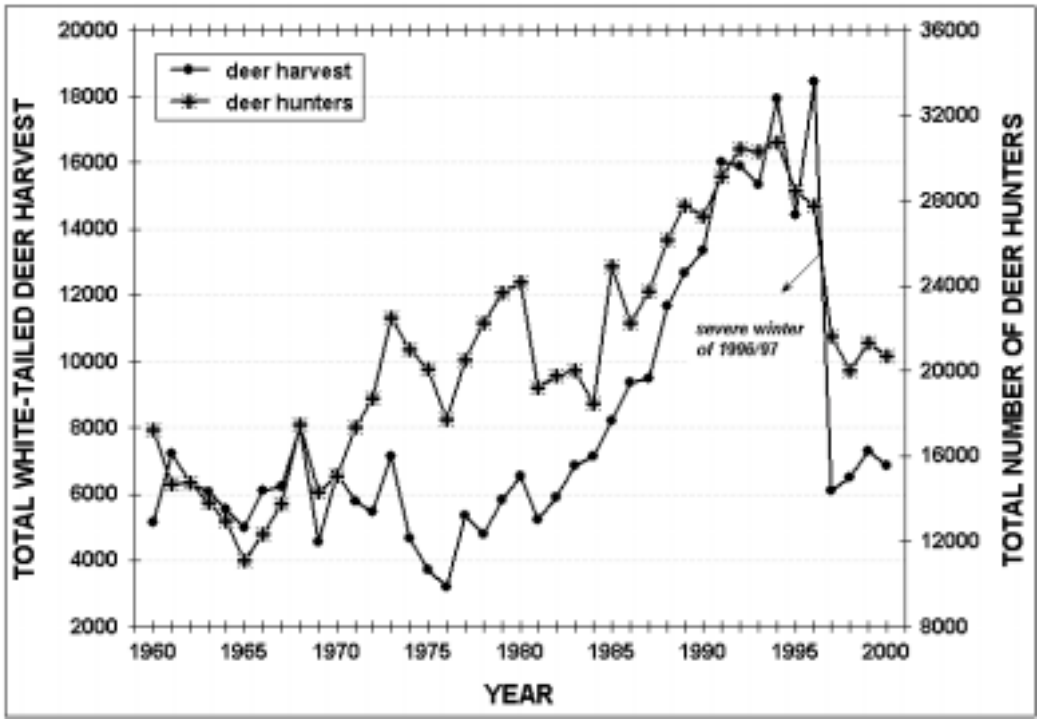

Figure 19. Montana Fish, Wildlife & Parks Region 1 white-tailed deer harvest and number of deer hunters, 1960-2000.

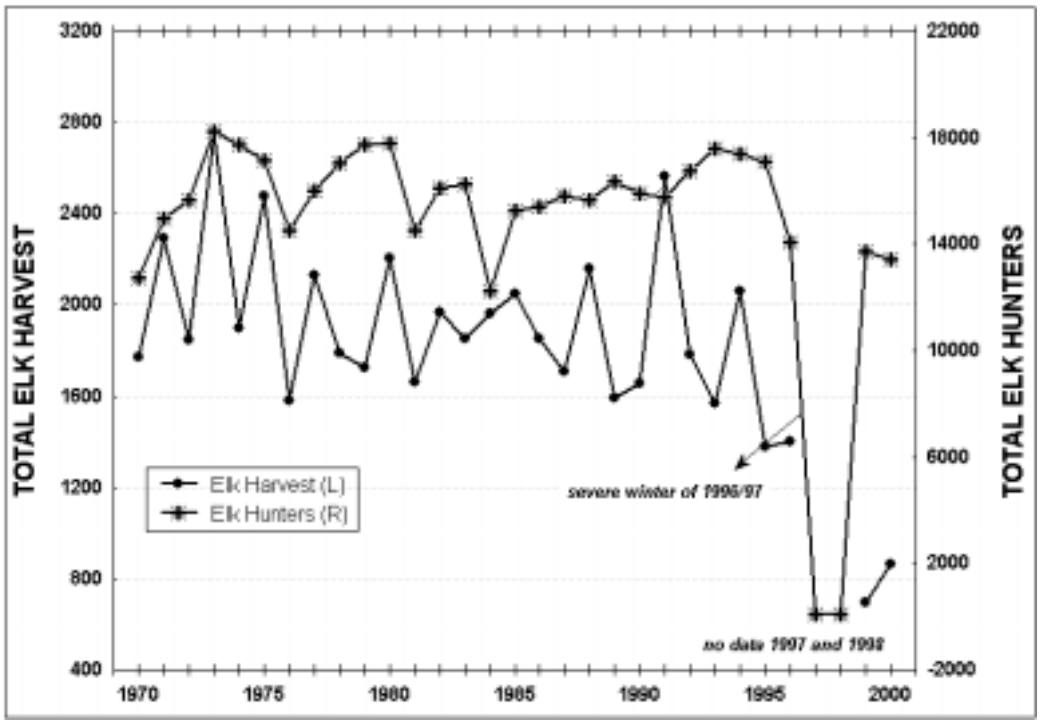

Figure 20. Montana Fish, Wildlife & Parks Region 1 elk harvest and number of elk hunters 1970-2000. Hunter opportunity for bull elk was reduced through adoption of the more restrictive "brow-tined bull" regulation in 1997-98 from the previous "antlered bull" regulation.

In other areas of the state, wolves are expected to prey primarily on elk, mule deer, and moose. In southwestern Montana, wolf packs seem to prey on elk more frequently than mule deer or moose (Smith et al. 2001; Gude and Garrott unpubl. data). Of the three species most likely to be killed by wolves in the Yellowstone area, elk are the most closely studied. Elk are important to human hunters as well.

The northern Yellowstone elk herd has always gotten a great deal of public attention because it is one of the largest and best known elk herds in the country, it is associated with YNP, and it provides a unique and very popular elk hunting opportunity during the so called "Gardiner late elk hunt." Since the 1970s, the northern Yellowstone elk herd has fluctuated up and down from less than 9,000 elk to about 19,000 elk, based on winter counts. The annual winter count changes 10-20% from year to year, but sometimes it changes by 30-40%. Compared to other Montana elk populations, northern Yellowstone herd counts are dynamic and very chaotic. During this same period, elk herds in other parts of southwestern Montana that are managed primarily by hunting, fluctuated 5-15% per year, with a clear long term trend toward increasing elk numbers. Most elk herds in southwestern Montana currently have two to four times as many elk now as they had in the mid-1970s.

Periodic, but significant winterkill events are the greatest single factor affecting elk numbers in the northern herd, with the last two occurring in 1989 and 1997. Winterkills of such magnitude do not occur in other Montana elk populations, even in severe winters. Yellowstone elk are predisposed to higher winter mortality due to harsher winter conditions, an older age structure in the population, high elk densities, and lack of an agricultural forage base to fall back on during hard winters.

Historically, northern range elk counts do not exhibit clear, long term trends. The northern herd has been surveyed from the air since 1967. Beginning in more recent years, two surveys are conducted – one in December and one in the spring. The purpose of the December survey is determine overall population trends by counting total elk numbers, using four fixed-wing aircraft simultaneously. These surveys yield trend information and are flown at the same time each year, regardless of counting conditions so that the count itself becomes an index to reflect changes in the elk population over time. The total count in December 2002 was 9,215 elk, with approximately 75% of the herd inside YNP. The previous count in December 2001 was 11,969, compared to a long term average of 13,846 elk from 1968-2002 (Table 9) (FWP 2002). Poor counting conditions likely contributed to an under count of the actual number of elk in the northern Yellowstone population for the 2002 count. Lack of snow cover, the wide distribution of elk at higher elevations, and difficulty in detecting elk were noted by observers. In previous instances of poor counting conditions, the previous or the following year's trend estimate were more consistent with long term averages. However, biologists concluded that the December 2002 data suggest that elk abundance has decreased since 1988 (Northern Yellowstone Cooperative Wildlife Working Group, 2003). Factors contributing to the decrease likely include predation, drought-related effects on pregnancy and calf survival, periodic substantial winterkill owing to severe snow pack, and human harvest during the Gardiner area late hunt. The second survey is flown in the spring (usually March) to determine how many elk wintered north of YNP and Dome Mountain and to classify the elk population to obtain an estimate of calf recruitment, expressed as the number of calves observed for every 100 cows (calf:cow ratio) (Table 9).

The northern herd demonstrates the natural ability to recover from periodic population declines. The most significant recovery started in 1968, following the end of deliberate elk reductions inside YNP and the end of largely unregulated elk hunting. The population increased from about 3,200 elk to over 12,000 just eight years later. Elk numbers have since recovered from major winterkills within five to six years. Wolves, however, are a new and significant source of mortality that will reduce total elk numbers. The exact extent of those overall population reductions, how wolf predation affects population growth rates, and the variation from year to year is unknown. FWP is concerned that during severe winters, more elk will be vulnerable to predation, and the combination of winterkill and predation could be significant.

FWP is also concerned about calf recruitment. There are early indications that the number of wolves that prey on the northern Yellowstone elk herd has leveled off because wolves may have reached their social and biological carrying capacity for area. Overall elk herd dynamics are largely influenced by environmental factors and predation dynamics that occur inside YNP boundaries. FWP's management of the portion of the herd that winters in the State of Montana north of YNP and the focus of the Gardiner late hunt will need to take that into consideration. Monitoring efforts are an important part of that management, particularly for determining the number of migrant, YNP elk wintering north of Dome Mountain.

While there are many factors that affect elk herd numbers and distribution (i.e. winter severity, weather during hunting season, drought conditions, and hunter pressure), the available data on the northern Yellowstone elk herd suggest that current herd size, hunter effort and hunter success are within the general ranges seen before the reintroduction of wolves. Data indicate that the late winter 2002 calf recruitment estimate (14 calves counted for every 100 adult cows) was a record low. Just like total elk numbers, calf recruitment in Yellowstone varies widely from year to year, ranging from 14-48 calves/100 cows, with an average of 32 calves/100 cows. However, across almost all areas of elk habitat in Montana, with a few exceptions, have experienced declines of 30-50% from the historical averages of the calf/100 cow ratios. This includes the elk population in the Missouri River Breaks. Recruitment in Yellowstone elk is typically lower than most elk populations in neighboring herds in southwestern Montana. Reasons for lower recruitment in Yellowstone elk include higher predation rates in a predator-rich environment that now includes wolves, lower pregnancy rates, an older age structure in female segment of the herd, long stressful winters, and the general physical condition of elk which varies with forage availability and quality. In recent years, persistent drought conditions have also affected overall herd health and condition, as well as recruitment rates. Long term studies are required to understand wolf effects on ungulates. Extensive studies of this wolf/ungulate relationship are now underway both within and outside YNP.

FWP administers the Gardiner late hunt to help manage elk numbers on winter ranges north of YNP. FWP's management objective is to provide winter range forage for migrant Yellowstone elk on a sustainable basis by managing elk numbers so they do not exceed the carrying capacity of the winter range and cause long term changes in plant communities or declines in forage production. To accomplish this, hunters are used as a management tool to help regulate the number of elk wintering north of the YNP boundary, by annually harvesting a portion of the migrant population. The number of antlerless elk permits available for the Gardiner late hunt changes through time, based on winter population counts, recruitment, previous hunter success, hunter participation, and the number of elk migrating to winter range north of YNP. The number of migrant elk available to hunters during the late hunt, thus hunter success, depends heavily on winter weather conditions that determine the timing and the size of elk migrations (FWP 2001b).

Elk hunting is also popular in other areas of southwestern Montana outside the Yellowstone area. Management objectives for many elk herds in southwestern Montana call for reducing total elk populations. Antlerless harvest opportunities have been liberalized in recent years where elk populations are exceeding social carrying capacity. Table 10 summarizes elk hunting information in FWP Region 3. As noted above, many different factors can affect herd population numbers and distribution. Similarly, many factors affect hunter harvest, independent of elk numbers. Weather, changes in hunting regulations and special permit availability, and human population changes in the region can all influence hunter success.

Outfitted Hunting. Outfitted hunting is significant and economically important to big game hunting in Montana. In the 2000 and 2001 hunting seasons, over 10,000 hunters used the services of a hunting outfitter. The majority of these guided hunters come to Montana from out-of-state, purchasing

nonresident hunting licenses and special permits. Only 1.5% of resident elk hunters utilize the services of an outfitter (King and Brooks 2001). Table 11 details the number of clients served (residents and non-residents) by outfitters for all species of big game hunting between 1995 and 2001. Outfitted big game hunting in Montana was relatively stable during that time.

Table 9. Summary of Northern Yellowstone Elk Herd population and late season harvest data, 1968-2002. Source: 2002 Gardiner Late Elk Hunt Annual Report, Montana Fish Wildlife and Parks (Table 9).

	2002	2001	2000	Last 5-year average (1998-2002)	Last 10-year average (1993-2002)	Long Term Average[a] (1968-2002)
Aerial Elk Count	11,969	13,400	14,538	12,668	13,908	13,846
Elk Migration north of Yellowstone National Park	5,104	3,833	3,500	4,753	5,260	5,207
Calves per 100 Cows (aerial survey)	14	29	23	24	27	32
Gardiner Late Hunt Harvest	1,103	1,221	940	1,233	1,363	1,095
Number of Permits	2,496	2,506	3,002	1,626	2,758	2,306
Hunter Success	56%	63%	42%	58%	63%	64%

[a] Long term trends vary by statistic due to differing availability of long term data.

Table 10. Montana Fish, Wildlife & Parks Region 3 elk hunting information, 1990-2001. No data are available for 1991, 1997 and 1998.

Year	Hunters	Hunter Days	Hunter Success	Bull Harvest	Antlerless Permits	Antlerless Harvest	Total Harvest
1990	38,590	248,367	23.0	4,248	13,484	4,691	8939
1991							
1992	46,475	291,878	28.9	5,739	16,391	7,697	13,443
1993	48,323	333,677	30.0	4,661	19,321	5,009	9,686
1994	51,653	334,229	34.1	7,391	20,803	10,279	17,602
1995	52,023	352,276	21.2	4,674	22,313	6,378	11,054
1996	48,944	326,135	36.0	7,057		10,619	17,676
1999	49,521	344,933	19.5	4,286	21,898	6,301	9,652
2000	52,139	344,264	30.0	6,750	20,993	11,417	15,641
2001	50,175	328,137	19.9	4,504	16,727	5,483	10,000

Table 11. Outfitter-reported total number of clients served on hunts for all big game species in northwestern Montana (Flathead and Lincoln counties) and southwestern Montana (Gallatin, Beaverhead, Sweet Grass, and Madison counties), 1995-2001. The totals include big game hunting clients served per year for both those clients buying licenses through the outfitter-sponsored license quota and those buying licenses on their own (non-sponsored). Source: Montana Board of Outfitters, Hunting Statistics.

Year	State of Montana		Northwestern Montana		Southwest Montana	
	Sponsored Non-Residents	Non-Sponsored[a]	Sponsored Non-Resident	Non-Sponsored[a]	Sponsored Non-Resident	Non-Sponsored[a]
1995	--	--	248	22	1,572	245
1996	8,235	858	307	16	1,791	273
1997	7,112	1,057	299	40	1,787	309
1998	7,032	1,148	424	25	1,638	393
1999	7,060	1,537	320	43	1,568	702
2000	7,875	2,327	429	126	2,017	709
2001	7,393	2,845	337	253	2,160	1,183

[a] Non-sponsored is the total of non-residents and residents who buy licenses on their own but who utilize the services of an outfitter during the big game hunting season. Non-sponsored totals may be slightly over-estimated because single clients could have hunted more than one species and may be tallied for each species hunted.

Regional Economics

Human Population. In 2000, Montana's population was 902,000 people. The population grew at a rate of about 12.9% between 1990 and 2000. Montana is sparsely populated compared to the entire country. There were an average of 6.2 people per square mile in 2000 - compared to 79.6 people per square mile in the United States as a whole. About 13 percent of the population in Montana is age 65 or older, slightly higher than in the United States as a whole (U.S. Census Bureau, State and County QuickFacts: http://quickfacts.census.gov).

Montana is rich in outdoor recreation opportunities. The state boasts national and international, recognition for its national parks, extensive wilderness areas, and high quality hunting, fishing, and wildlife viewing opportunities. Not surprisingly, residents of the state (and the three state region of Montana, Idaho, and Wyoming) value outdoor recreation highly. In a 1992 study, Duffield et al. (1993a) found that 79% of the people who live in the 20 counties immediately surrounding YNP (including the contiguous states of Idaho and Wyoming) participated occasionally or frequently in outdoor recreation activities, compared to 69% of people nationwide. GYA residents had higher rates of participation in fishing (73%, compared to 48% nationwide), viewing wildlife (90%, compared to 67%), and hunting (60%, compared to 25%). Not surprisingly, GYA residents were more likely to have hunted deer, elk, or moose, and were much more likely to have hunted these species in Idaho, Montana, or Wyoming than were residents of the U.S. as a whole.

The Montana Economy. In 1997, Montana per capita personal income was $19,660, having grown 5.5% since 1987 (U.S. Department of Commerce, Bureau of Economic Analysis 2002). Total personal income in the state was $17.3 billion in 1997.

The economic sectors most likely to be affected by wolf restoration are agriculture and tourism, including outfitting related to hunting and eco-tourism/wildlife viewing. Table 12 shows the key economic sectors (types of business producing similar goods and services) broken out at the finest level of detail available. Farm output (the total value of goods and services produced) accounts for approximately 6.3% of total state output. Farm income accounted for about 2% of the total personal income in the state, and livestock accounted for 48% of the value of farm products sold in the state in 1998 (Montana Agricultural Statistics Service 1999).

Tourism is also important "industry" in Montana. Visitors come to Montana in large numbers year round to see parks and wilderness areas, ski, float rivers, fish, hunt, and simply enjoy scenery. While they're here, these visitors spend large amounts of money for food, lodging, license fees, guide fees, and gifts among other recreation-related spending. These expenditures, in turn, have a large impact on incomes and employment in the region. Duffield et al. (2001) found that visitors to YNP who came from outside the three-state region of Montana, Idaho and Wyoming spent an average of $680 per person in the three states for winter visits in the region and $291 per person while on summer trips. Economic activity associated with tourism is captured by a number of sectors, including transportation services, hotels and other lodging, recreation services, and retail trade (Table 12). However, these sectors also include economic activity not specifically tied to tourist spending, so it is difficult to extract the total percentage of state economic output associated with tourism from Table 12. Nonetheless, the tourism industry is consistently ranked in the top three industries (as measured in total output).

Outfitting of all kinds, including fishing, hunting and ecotourism are combined into the recreation services sector of Montana's economy. This also includes skiing and other tourist services. Both big game hunting and outfitting services have a strong link to the level of economic activity through hunter expenditures. The 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation found that U.S. residents spent $216 million in Montana on hunting trips, equipment, and licenses (USFWS and U.S. Department of Commerce 1998). USFWS estimated that of hunting-related expenditures within Montana, $182 million was spent specifically for hunting trips and equipment. About 69% of this, or $126 million, was specifically spent for big game hunting. Of the total hunting trip-related spending in Montana in 1996, nonresidents spent 65% of the total (Table 13). FWP studies have demonstrated that trip-related hunting expenditures are even higher than the national survey results. Residents and nonresidents spend an average of $186.9 million on their hunting trips in Montana annually (Duffield and FWP 1988). Approximately 45% of those expenditures are by nonresidents.

Non-hunting outfitting appears to be increasing in Montana, particularly for visitation in Montana's national forest roadless or wilderness areas. (Adams 2000). According to a 1998 survey of outfitters using these wildland areas, hunters accounted for less than 14% of all clients and a fifth of their service days. A similar survey published in 1990 found that in the Montana commercial outfitting industry as a whole, 24% of clients were hunters (Taylor and Reilly 1990). Possible explanations for the shift include changing interests in outdoor recreation away from hunting, thus changing consumer demand, and a need for outfitters to generate income during other seasons of the year. Those non-resident clients who do not hunt but utilized the services of a wildland outfitter for outdoor recreation (e.g. wildlife viewing, or photography) spent $37.2 million for food/lodging, transportation, and outfitter fees in Montana in 1998 (Adams 2000).

Table 12. State of Montana, Output, Employment and Income: 1999. Industry output is reported in millions of 1999 dollars. Source: Minnesota IMPLAN Group 2002.

Industry	Industry Output	Employment	Employee Compensation	Proprietor Income
Farms	2,385	32,009	137	289
Forestry Products	78	1,001	4	7
Ag Services	125	4,798	23	33
Metal mining	331	1,939	107	(18)
Coal Mining	257	970	65	14
Oil mining	253	2,058	46	18
Non-metal mining	111	951	41	0
Construction	3,766	39,527	778	380
Food processing	819	2,848	82	1
Textiles	2	24	0	0
Apparel	69	717	7	1
Wood products	1,455	8,827	268	31
Furniture	72	871	13	4
Pulp and paper	327	810	45	3
Printing and publishing	308	3,525	84	3
Chemicals and allied	234	712	29	5
Petroleum products	1,554	909	63	2
Rubber products	62	429	11	0
Leather products	4	103	1	0
Stone, glass and clay	212	1,244	38	4
Primary metals	270	1,101	50	15
Fabricated metal	100	1,159	28	2
Industrial machinery	419	2,109	61	2
Electrical equipment	79	474	16	1
Transportation equipment	113	596	21	1
Scientific instruments	52	370	13	1
Miscellaneous mfg	167	1,963	43	1
Railroads and Related Services	499	2,902	192	0
Local- Interurban Passenger Transit	63	1,820	24	4
Freight Transport and Warehousing	968	9,353	192	109
Water Transportation	12	81	1	0
Air Transportation	200	2,539	82	3
Pipe Lines- Except Natural Gas	56	110	7	0
Transportation Services	65	1,511	30	8
Communications	726	4,040	144	27
Utilities	1,025	3,070	169	12
Wholesale Trade	1,623	20,683	630	40
Retail Trade	3,402	104,190	1,379	159
Banking	1,024	6,839	208	6
Credit Agencies	146	3,878	70	7
Security and Commodity Brokers	171	1,441	83	17
Insurance Carriers	284	2,630	97	0
Insurance Agents and Brokers	198	5,102	81	36
Real estate	2,222	12,948	70	108
Hotels and Lodging Places	405	11,600	149	12
Personal services	247	10,360	53	55
Business services	1,023	22,913	299	154
Automotive services	477	7,066	102	52
Repair services	199	3,729	36	27
Motion Pictures	123	1,832	18	5
Recreation services	366	13,272	94	56
Health services	2,508	42,919	1,190	231
Legal Services	254	4,280	116	65

Table 12. Continued

Industry	Industry Output	Employment	Employee Compensation	Proprietor Income
Education services	185	7,053	83	7
Social services	447	11,839	189	0
Non-profit organizations	627	11,392	185	1
Professional services	960	19,734	334	104
State & local non-ed government	1,342	25,856	820	0
Federal non-military	913	17,647	721	0
Special sectors	(180)	0	0	0
Federal Government - Military	501	8,563	290	0
State & Local Government, Education	1,028	35,451	1,028	0
Domestic Services	28	3,588	28	0
Totals	37,763	554,276	11,266	2,102

Table 13. Summary of expenditures associated with hunting in Montana by all U.S. Residents, 1996. Source: USFWS and U.S. Department of Commerce 1998, Table 15. Not all expenditure items are included in the table, so the items shown will not sum to the total.

Expenditure Item	Amount ($1000s)	Average per Hunter
Total spending	215,878	954
Food and lodging	44,043	226
Transportation	36,244	186
Other trip costs	19,318	99
Equipment costs	45,764	207
Licenses and land leasing and ownership	31,007	159

Recreational and Social Values

Hunting Values. Wolves have the potential to influence several types of recreation, including hunting and tourism. The net economic values that an individual places on these recreational experiences have been estimated on a per-trip or per-day basis in a number of studies. This net economic value (sometimes referred to as willingness to pay) is the additional amount of money hunters and other recreationists say an activity is worth over and above actual expenditures. Expenditures commonly include transportation costs, lodging, food, guide fees, and other purchases, excluding license fees. Nonresidents place substantially higher values on their hunting-related recreational experiences in Montana than residents (Table 14). An examination of nonresident big game license sales (discussed below under FWP Fiscal) shows that nonresident hunting values are substantial based on their willingness to pay for the license fees (up to $1,100) for the right to hunt deer and elk in Montana. Data from a 1992 survey of outfitter fees paid for hunting on private land also tend to show substantial value attached to hunting in Montana (Duffield et al. 1993b). For the relatively small subsample of outfitters who paid landowners on a per-animal-harvested or per-hunter basis (as opposed to the more common lump sum rental for a season's access), the per-animal charges were between $50 and $200 while the per hunter charges were between $10 and $1000.

Table 14. Comparison of net economic value (NEV) per day estimates for Montana deer and elk hunting trips (in current 2002 dollars). Sources: Duffield and Neher (1990) and King and Brooks (2001) for deer and elk, respectively.

Species	NEV/day for Montana Resident Hunters	NEV/day for Nonresident Hunters
Deer	$74.00	$102.44
Elk	$109.00	$116.00

Wildlife Viewing Values. Visitors to Montana often cite wildlife watching as an important aspect of their trips to the state. As with hunting, studies have also estimated the net economic value of a day of watching wildlife. USFWS estimated that within the USFWS region containing Montana, residents spend an average of 10.5 days per year engaged in wildlife viewing. USFWS further estimated that the net economic value of wildlife viewing in the region containing Montana is $31 per day (USFWS and U.S. Department of Commerce 1998).

Relatively more is known about the wildlife viewing values of visitors to YNP than about visitors to GNP or Montana as a whole. Visitors entering YNP from Montana in 1999 cited wildlife viewing as a primary activity during their trip. Overall, 62.1% of winter park visitors and 94.9% of summer park visitors listed wildlife viewing as an activity (Duffield et al. 2001). Surveys of both winter and summer visitors to YNP have also consistently shown that the gray wolf is one of the species which visitors desire to see the most (Table 15). Interestingly, grizzly bears are some of the most rarely seen of all species in the park (Duffield et. al 2001). However, frequently seen species are also in the top 10 list, such as bison, elk and bighorn sheep. These findings suggest that visitors have well-defined preferences for wildlife viewing and that preferences across winter and summer visitors are similar.

Table 15. Wildlife species visitors to the Greater Yellowstone Area would most like to see, in order of preference. Preference is measured as the percentage of respondents who cited a species as one of the top three species they would most like to see on their trip. Rank is shown in parentheses. Source: Duffield et al. 2001.

Species	Winter Visitors	Summer Visitors
Grizzly Bear	36.0% (2)	58.0% (1)
Wolf	41.1% (1)	36.0% (2)
Moose	31.2% (4)	35.0% (3)
Mountain Lion	31.9% (3)	31.0% (4)
Black Bear	12.8% (9)	29.0% (5)
Elk	26.1% (5)	14.0% (9)
Bison	27.6% (6)	19.0% (8)
Bighorn Sheep	25.0% (7)	23.0% (6)
Bald Eagle	22.1% (8)	21.0% (7)
Wolverine	11.9% (10)	6.0% (10)
Trumpeter Swan	6.3% (11)	4.0% (11)
Sample Size	1127	1302

Recreational Trip Values. Two of the nation's premier national parks (Yellowstone and Glacier) are found, at least partly, within Montana. A number of studies documented the popularity of these parks as tourist destinations, both nationally and internationally. A 1999 summer visitor survey for YNP found that Montana, Wyoming, or Idaho residents placed a net economic value of $56.80 for their summer trips and nonresidents placed a value of $349.09 on their trips (Duffield et al. 2000).

The 1999 YNP winter and summer surveys also asked visitors whether the possibility of seeing wolves had affected their decision to visit the GYA (Table 16). Nineteen to 42% of visitors reported that seeing or hearing wolves was one of the reasons for making their trip to the GYA. However, a substantial majority would still have made the trip to the GYA if wolves were not present. Approximately 3.5% of current visitors to the park would not make the trip if wolves were not present in the park. Given that there are over three million visitors annually to YNP, it represents over 100,000 visitors.

Table 16. Percent of respondents who reported whether the possibility of seeing wolves affected their decision to visit the GYA. Source: Duffield et al. 2001.

Question/ Response	Winter	Summer	
		Residents	Nonresidents
Was seeing or hearing wolves one of the reasons for making the trip to the GYA?			
Yes	35.9%	41.6%	42.0%
No	64.1%	58.4%	58.0%
Sample size	1,143	221	1,070
If yes, would you still have made this trip even if wolves were not present in the GYA?			
Yes	76.1%	73.9%	80.1%
No	10.2%	8.7%	7.9%
Not sure	13.7%	17.4%	12.0%
Sample size	551	92	443

Social and Cultural Values. Wolf recolonization in northwestern Montana and the reintroduction of wolves into YNP and central Idaho raise a number of issues, including their place in the ecosystem and their effects on people and other animals. Because public comments were used to develop the alternatives for this EIS and to assess their consequences, public issues and concerns are integrated throughout the draft EIS. The purpose of this section is to discuss the social and cultural attitudes and values that underlie the public comments, and to lay the groundwork for assessing how cultural values and the social environment could be affected by the various alternatives.

When discussing social and cultural implications associated with wolves, the primary affected environment is the values of people living within or near the recovery areas and the values of people statewide. To many, the gray wolf symbolizes wildness and is valued intrinsically for reinhabiting parts of their former range. Others value the role the wolf plays in the larger ecosystem. For many farmers and ranchers, however, the wolf is a potential threat to their livestock and livelihood. Also, many people fear wolves and view them as a personal threat. For Native Americans, the wolf plays an important positive role and many traditional views of the wolf continue today. The gray wolf attained a cultural significance to many Native American tribes in Montana. For the Blackfeet, the wolf is a powerful religious symbol and is known as a "medicine animal" (Vest 1988).

Values can also be described in terms of attitudes toward wildlife and wildlife management. Respondents to the 1999 winter and summer YNP visitor surveys were asked to state their level of agreement or disagreement with a number of statements pertaining to wildlife and the environment. Table 17 shows how Montana residents responded during the two visitor surveys. Responses are remarkably stable between winter and summer YNP visits and both sample groups indicate a very high level of environmental interest and concern.

What drives the differences in attitudes towards wolves might be summed up as the perceived chance of personal benefit or loss resulting from the presence of wolves. Those who feel they will benefit either directly or vicariously tend to favor wolf restoration, and those who perceive the threat of personal loss oppose restoration. A survey in Flathead County in northwestern Montana indicated that most respondents were supportive of wolves naturally recolonizing the area, but that support could decrease if recreational and commercial land uses were restricted to promote wolf recovery (Tucker and Pletscher 1989). One survey in Wyoming found that most respondents who opposed wolf reintroduction would not change their responses even if a variety of their concerns were met, such as providing financial compensation for livestock losses due to wolves (Bath and Phillips 1990). This firmness of position indicates that some attitudes towards wolves have their basis not only in the tangible fear of financial losses but also, more deeply, in the history of the area and its people. Furthermore, attitudes towards wolves are rooted in society at least as much as they are based on wolf biology and will not be susceptible to campaigns intended to change them. Williams et al. (2002) advises that wildlife managers would do well to recognize that and maintain open dialogue with the general public and the affected interests.

One of the most detailed sources of data on Montana resident attitudes towards wolves specific to the wolf reintroduction effort is a survey of GYA residents conducted in 1993, including Montana counties contiguous to the park and several mostly rural counties in Idaho and Wyoming (Table 18). The responses show both general support for wolf presence in the park and specific concerns associated with potential problems related to livestock depredation and reduced big game hunting opportunities outside the park.

Table 17. Comparison of responses by Montana residents to statements concerning wildlife and wildlife habitat when asked during winter or summer visits to Yellowstone National Park. Source: Duffield et al. 2001.

Statements	Percent who agree		Percent who disagree	
	Winter	Summer	Winter	Summer
I have a great deal of concern for protecting wildlife habitat	95.1%	97.7%	1.2%	1.4%
Wildlife species must be beneficial to humans to deserve protection	20.7%	24.4%	68.0%	65.6%
It's important to protect rare plants and animals to maintain genetic diversity	83.5%	87.8%	5.9%	2.7%
I would be willing to contribute to protecting wildlife habitat even if I never see or enjoy the animals	67.6%	63.2%	10.8%	10.0%
Sample size	436	219	436	219

Table 18. Greater Yellowstone Area residents' attitudes toward issues surrounding wolf reintroduction. The "percent agreeing" includes the sum of responses for the categories "somewhat agree" and "strongly agree." "Percent disagreeing" was also aggregated. Because other response categories are not reported (e.g. "no opinion" and "not applicable"), data will not sum to 100%. Source: Duffield et al. 1993a.

Attitude Statement	Percent Agreeing	Percent Disagreeing
I would derive satisfaction from just knowing wolves are present in Yellowstone Park	46.5%	41.0%
I dislike even the idea of wolves being present in Yellowstone Park.	35.1%	57.4%
I might personally benefit from getting to hear or see wolves in Yellowstone Park.	47.5%	42.1%
I would like it if visitors to Yellowstone Park had the opportunity to hear or see wolves.	59.1%	31.2%
I would experience reduced hunting opportunities if wolves were reintroduced to YNP	21.3%	32.4%
I would be disappointed if hunters hunting on lands adjacent to YNP experienced reduced hunting opportunities due to the reintroduction of wolves into the park.	41.2%	36.2%
I would experience livestock losses due to wolf predation in my farming or ranching operation if wolves were reintroduced to Yellowstone Park.	23.4%	13.9%
I would be disappointed if ranchers outside the park experienced livestock losses due to the reintroduction of wolves into the park.	72.6%	13.7%

FWP Fiscal Environment

FWP derives a large portion of its annual operating budget from the sale of fishing and hunting licenses and matching federal dollars collected through excise taxes on the purchases of hunting and fishing related equipment. The choice of wolf conservation and management policies has the potential to affect FWP finances directly by how a wolf program is funded and indirectly through the interaction between wolves and their ungulate prey populations. For example, a substantial decrease in deer or elk numbers, by whatever cause or combination of causes, could lead to a lower level of hunter participation or lower license revenue. The decline may be exacerbated or prolonged in localized areas by the presence of a recovered wolf population. However, new license revenue may be generated by implementing a regulated harvest program for wolves as a management tool within the broader context of the overall program. Table 19 shows annual trends in Montana resident deer and elk license sales and prices. The number of deer licenses sold has declined slowly since 1980, while the number of elk licenses sold has remained relatively stable. Table 20 summarizes license revenue for the year 2000 from the sales of the major classes of deer and elk licenses and special permits.

Despite relatively consistent hunting regulations and hunting opportunity for antlered deer and elk, statewide resident elk and deer general license sales have declined since the mid-1990s. A survey of elk license holders, who purchased a license in 1996 and 1997 but not in 1998, was conducted to determine the reasons why these individuals did not purchase a license in 1998. The most frequently checked reason was *"other responsibilities a higher priority"* followed by *"access has become restrictive, low elk population, unsuccessful at special elk permit drawings, and unable to hunt with family or friends"* (FWP unpubl. data). Another factor influencing elk license sales is the aging of resident hunters. A study in

1988 showed that the average age of hunters was 38 years old. A similar study in 1998 revealed the average to be 46 years old (FWP 1988, 2001c). Therefore, license sales for resident hunters in the future will likely be influenced by factors well beyond the presence of a recovered wolf population.

By contrast, nonresident demand for Montana hunting licenses remains high, despite a considerably higher cost compared to residents. Nonresidents submit more applications than the nonresident allocation quotas for most categories of deer and elk licenses. About 85% of the total deer and elk license revenues come from nonresident license sales (Table 20).

Table 19. Trends in resident Montana deer and elk license sales and prices, 1980-2000. Source: Montana Fish, Wildlife and Parks license data.

Year	Adult Elk License		Adult Deer A License	
	Licenses Sold	Price	Licenses Sold	Price
2000	68,826	$16.00	88,233	$13.00
1999	72,281	$16.00	91,606	$13.00
1998	78,844	$16.00	92,569	$13.00
1997	77,252	$16.00	75,344	$13.00
1996	82,433	$16.00	107,689	$13.00
1995	87,244	$16.00	117,967	$13.00
1994	87,480	$16.00	121,903	$13.00
1993	86,917	$13.00	118,700	$13.00
1992	85,895	$13.00	121,918	$11.00
1991	82,680	$10.00	117,325	$11.00
1990	79,437	$10.00	114,106	$9.00
1989	78,604	$10.00	111,750	$9.00
1988	74,473	$10.00	111,515	$9.00
1987	59,674	$10.00	105,813	$9.00
1986	62,060	$10.00	108,196	$9.00
1985	63,862	$10.00	111,698	$9.00
1984	62,001	$10.00	122,309	$9.00
1983	64,376	$10.00	128,847	$9.00
1982	70,669	$9.00	131,051	$9.00
1981	87,070	$8.00	138,156	$8.00
1980	83,844	$8.00	131,723	$7.00

Human Safety

Along with other state and federal agencies as well as private organizations, FWP has recently taken a proactive approach to help people learn how to live and recreate in wildlife habitats. Increasing numbers of people are living within the urban-wildland interface where a potential for conflict with a wide variety of wildlife species exists. Outdoor recreation trends also show increasing numbers of people recreating in wildlife habitats where interactions could become more frequent (Youmans 1999). Living and recreating in wildlife habitats has inherent risks. Through policy development, public outreach, and technical assistance to landowners and recreationists, FWP is working towards mitigating those risks to the extent possible.

In accordance with Montana statutes, FWP and the FWP Commission are charged and authorized to protect people and personal property from damage and depredation caused by wildlife. FWP defines a public safety problem related to carnivores as: any situation where an FWP employee reasonably determines that the continued presence of a carnivore poses a threat to human safety, an attack has resulted in the loss of livestock or personal pets, or that a human has been physically injured or killed.

Table 20. Montana Fish, Wildlife & Parks 2000 revenue from major deer and elk license and permits. Source: FWP historical license sale records.

License or Permit Type	Number Sold	Price	Total FWP Revenue (dollars)
Resident - Elk Permit	39,945	$3.00	119,835
Resident - Elk License– Adult	68,826	$16.00	1,101,216
Resident - Elk License Senior or Disabled	16,704	$8.00	133,632
Resident - Deer A License - Adult	88,233	$13.00	1,147,029
Resident - Deer A License - Senior or Disabled	21,709	$6.50	141,109
Resident - Deer B Permit	40,592	$8.00	324,736
Resident Total Fees			2,967,557
Nonresident- Drawing Fee	196,759	$3.00	590,277
Nonresident - Big Game Combo -General	10,715	$475.00	5,089,625
Nonresident - Big Game Combo – Outfitter	5,606	$975.00	5,465,850
Nonresident - Deer Combo - General	2,300	$245.00	563,500
Nonresident - Deer Combo - Outfitter	2,304	$850.00	1,958,400
Nonresident - Deer Combo - Landowner	2,000	$250.00	500,000
Nonresident - Elk Combo - General	785	$425.00	333,625
Nonresident - Elk Combo - Outfitter	623	$875.00	545,125
Nonresident Total Fees			15,046,402
Total of Resident and Nonresident Fee Revenue			18,013,959

Wolf-human Encounters

Public safety is an important consideration because species such as the gray wolf, mountain lion, black or grizzly bears are capable of injuring or potentially killing a person. It is also possible for a rabies-infected wolf to transmit the disease to humans. Though wolves generally fear humans, there are cases where individual wolves lost their fear of people and caused injuries, but no human fatalities have been reported in North America (Mech 1998a, Route 1999). Historically, human fatalities were reported in Old World Europe prior to white settlement of the New World. Rabies is thought to have been a factor (Paradiso and Nowak 1982). McNay (2002) provides a comprehensive review of case histories of 80 incidents of wolf-human interactions in Alaska and Canada, spanning from 1900 through 2001. It appears most wolf-human encounters were not precipitated by the wolf perceiving the human as prey because of how the wolves behaved, the presence of domestic dogs, or the duration and type of interactions between wolves and humans leading up to the incident (Mech 1998a, McNay 2002a, Carnes and Van Ballenberghe unpubl.). Instead, wolves losing a sense of fear of humans seems to be a common thread running through most North American wolf incidents resulting in human injury (Mech 1998a, McNay 2002b). Of the 80

cases reviewed by McNay (2002b), 39 included elements of aggressive behavior by healthy wolves, 29 were not aggressive, and 12 cases involved known or suspected rapid wolves. Of the 16 cases in which healthy wild wolves bit people or their clothing, 10 of 16 resulted in minor injuries while six were considered severe. Linnell et al. (2002) also provided a review of wolf attacks on humans. The authors conclude that there have been relatively few wolf attacks in North America. This is in stark contrast to the case histories of mountain lion-human incidents in which mountain lions sometimes appear to perceive humans as prey (Deurbrouck and Miller 2001). Case studies of injurious bear-human incidents highlight surprise encounters, defense of cubs or food, and/or the bear perceiving the human as a threat to be neutralized (Herrero 1985).

The potential for wolves to transmit rabies to humans deserves special mention in the context of human safety. Information for this section is taken from Linnell et al. (2002). Rabies, a viral infection of the central nervous system, is usually transmitted by a bite. While the disease is highly infectious, not all bites from a rabid animal actually transmit the disease. Immediate post exposure vaccination can prevent the disease from becoming established in most cases. Disease transmitted by bites to the head and face is usually not responsive to post-exposure treatment. The primary source of rabies infection in humans is by domestic dog bites. However, in Europe, Asia and to a much lesser extent North America, rabies does occur in wild wolves as primarily isolated incidents in which a single animal or a pack become infected from exposure to a carrier such as red or arctic fox. Linnell et al. (2002) report that the number of rabies cases in North American wolf populations is low despite the relatively large population in northern latitudes. Despite the low frequency, when wolves do become infected, it appears that the disease progresses to the "furious" stage with some degree of regularity. This stage of the disease is usually accompanied with excessive salvation and bouts of hyperexcitability in which a wolf can travel widely. These are the cases in which wolf behavior can become especially aggressive towards humans, other animals, and domestic livestock. All cases of known confirmed rabies in North America were documented in Canada and Alaska. See Linnell et al. (2002) for a thorough review and occurrence reports across Eurasia and North America.

It appears that wolves can habituate to humans or human activities as readily as bears or mountain lions (Aune 1991, McNay 2002b). Habituation in wolves may not require a consistent pattern of food conditioning, as is often the case for bears. Wolves may increasingly tolerate or even seek out close proximity with people through repeated social interaction with people and where they are "rewarded" in some fashion, whether by acquiring food or novelty items such as shoes. While some time may be required for a wolf to habituate to human proximity, some case histories suggest that it can occur within days of the first encounter (McNay 2002b). Other important variables are whether or not there are food rewards, the frequency of interaction, the individual character of each wolf, the presence of domestic dogs, and whether the wolf is infected with rabies. McNay (2002a) cautioned that the transition from non-aggressive behavior to aggressive behavior in habituated wolves could be rapid and unpredictable. Whether or not habituation escalates to an immediate threat to human safety may hinge on a prompt management response by the appropriate authorities.

Surprise encounters between wolves and humans may also occur (McNay 2002b). In Montana, hikers have unknowingly encountered an occupied den site and wolves responded by barking. Other encounters occurred away from wolf den sites and ended when the wolf retreated, without injury to human or pet. Reported wolf behavior in these cases was consistent with other case histories reviewed by McNay (2002b). Since the mid-1980s, the only two injuries to humans by wolves in Montana occurred when wolf researchers and managers handled unrestrained animals during capture operations. However, there have been eight mountain lion-human incidents in Montana from 1990-1999 in which seven people were injured and a young boy was killed (FWP unpubl. data). In all of these encounters, the human was not aware of the lion.

Wolves have injured and killed domestic pets, primarily dogs and llamas in Montana. Most incidents involved guarding or livestock herding dogs, although in some instances, the dog was killed in close proximity to a structure or outbuilding. Other cases of dog depredations were of hunting hounds trailing mountain lion or bobcat scent. Hounds do not typically switch scent trails from felids to canids, but may encounter wolves while pursuing wild cats or at lion kills assumed by wolves. Bangs and Shivik (2001) also noted that wolves probably perceived hunting hounds and guarding/herding dogs as "trespassing" competitors rather than as prey.

A recent review of wolf attacks on dogs in Finland suggested that wolves could attack domestic dogs either within the context of territorial defense or food acquisition (Kojola and Kuittinen 2002). Territorial defense was most plausible in forested settings and often involved more than one wolf. In most instances, wolves ate the dog upon its death. There are no methods to prevent wolf predation on domestic dogs in hunting situations in which its owner does not directly supervise the dog. Food acquisition was more consistent with single wolves attacking dogs in rural house yards. Preliminary evidence indicated that risk of wolf attacks on dogs might be associated with density of natural prey and the predation efficiency of individual wolves or packs.

Despite their general wariness of people, wolves will use natural habitats in close proximity to humans and may sometimes approach very close to buildings or structures. This is particularly true in northwestern Montana where people build their homes in thick, forested habitats. Members of the Murphy Lake pack are occasionally seen within 100 yards of homes and in rare instances closer. While this pack is clearly accustomed to human activity within its home range, its members have shared the landscape with people for about 10 years without a human-wolf incident. As wolves disperse from established packs occupy more habitat in Montana, they will be seen more and more frequently. Some of those observations will be close to human development, particularly if wild prey species are in the area.

Because wolves live in social groups, people may see them more frequently than other large carnivores, although wolves are not necessarily any more dangerous. Mountain lions and bears are solitary, except for mothers with dependent young or during the breeding season. Wolves are much less secretive than mountain lions. Wolves may feed and rest in open areas with good visibility, whereas lions tend to hide their kills and feed or rest in dense vegetative cover. Wolves will also readily travel across openings in forest cover or natural meadows in ways that mountain lions or bears do not. In addition, wolves use linear corridors such as roads, utility lines or railroad rights-of-way for traveling and scent marking. Because of the differences between the secretive stalking behavior of mountain lions and the broad, open searching behavior of wolves, people probably have a greater, yet still remote, chance of an unexpected close encounter with a mountain lion than with a wolf.

The natural order of existence for wolves in the wild is to belong to a pack. With pack membership come "duties", such as establishment and maintenance of social hierarchies, patrolling and marking territory boundaries, hunting, feeding and tending pups, resting, and interacting with other wolves or wildlife species. Wolves affiliated with a pack are usually actively engaged in a "purpose" and do not spend extended periods of time loitering in any one location, particularly near humans. One exception is extended presence and activity at den or rendezvous sites. When pack-affiliated wolves are seen alone, it is usually sporadic travel for a particular reason. Even dispersing wolves generally do not loiter and move through areas near people. In contrast, a single wolf seen repeatedly loitering in an area near people and does not appear to be affiliated with a pack can become habituated, food conditioned, depredate livestock or domestic pets, or otherwise interact with people at decreasingly safe distances. If this pattern is allowed to continue, the wolf may become a safety concern. This will become especially evident if the animal does not respond to hazing or harassment and repeatedly returns to an area.

Wolf Monitoring

Presently, USFWS and its cooperative partners conduct all wolf monitoring. University students and faculty, individual citizens, private organizations, or other state and federal agency personnel collect additional information about wolves. While the focus of the current USFWS monitoring program is the documentation of breeding pairs that meet the recovery definition criteria, additional knowledge is gained in the process. Generally, most prey population monitoring is conducted by FWP, although cooperative efforts involve universities and other agencies.

Using telemetry as the primary monitoring tool, USFWS documents overall wolf population status and trend by recording reproduction and known mortalities. USFWS also generates information about wolf pack size and distribution, individual territory boundaries, how packs move through and use their territories, locations of wolf dens and rendezvous sites, and interactions between packs. USFWS documents known wolf dispersal events between and among the three federal recovery areas and Canada. USFWS has also been investigating non-telemetry based monitoring protocols, such as track surveys, to assess the validity of less stringent definitions of "breeding pair" than the recovery definition. Special management needs, opportunities, and constraints have also been identified.

USFWS collects information through observational reports of wolves and wolf sign (tracks, scat) submitted by citizens and resource management agency personnel. Repeated observations of animals and/or sign in an area often leads to the discovery of new packs and confirms pack persistence through time. USFWS also collects information through track counts, howling surveys to confirm presence/absence, and data profiling of genetic material. Anecdotal information supplements formal monitoring protocols, including depredation investigations by WS that document wolf activity in a new area or the number of wolves in a pack.

For the first five years after the gray wolf is delisted, FWP will be required to document that the wolf population is secure within Montana. FWP, USFWS, and state officials in Idaho and Wyoming will work cooperatively to design the protocols and the precise monitoring requirements prior to delisting. Periodic review of these data by FWP and similar agencies in Idaho, Wyoming, and other cooperators, will be necessary to ensure that the tri-state population remains above the northern Rockies recovery levels. FWP recognizes that beyond its legal requirement for population monitoring, FWP will improve management of wolves and native prey by collecting scientifically credible information. Radio collars deployed by USFWS may still be functioning when the state assumes management authority. FWP expects to have some reliance on telemetry-based monitoring protocols initially, but like USFWS, FWP could also investigate other, less expensive protocols or definitions of what constitutes a pack. For instance, unpublished USFWS data indicate that there is a strong correlation between the number of breeding pairs meeting the federal recovery definition and the number of "social groups" of wolves, if social group is defined more generally to mean four or more wolves traveling in winter. The monitoring intensity and expense required to monitor social groups would likely be less than the intensity of monitoring the number of breeding pairs, yet the reliability and accuracy of the data may be adequate. USFWS and FWP are currently exploring these relationships.

Private Property

FWP has authority to manage wildlife over approximately 88.3 million acres, or roughly 93% of the state (excludes national parks and reservations). Approximately 58.4 million acres of the total is privately owned, hosting a significant wildlife resource which, itself, is "publicly" owned. Much of that land is used for agricultural purposes (crops or livestock grazing). The earliest European settlers brought farming traditions and livestock with them. Montanans have been raising livestock for more than four

generations. Agricultural heritage is woven through Montana's cultural fabric, just like the heritage of wildlife conservation. The rural characteristics of one affirm the other.

Farming and ranching maintains open space that is also habitat for a diversity of wildlife species, including wolves. Maintaining the land base for agriculture and wildlife habitat is an increasing challenge, given broader trends in resource and agricultural economics, human population demographics, and development of the "New West" (Riebsame 1997). There are secondary benefits to a vigorous agricultural industry, including sustained economic activity in small rural communities, decreased rates of land conversion for subdivision and development, and maintenance of rural lifestyles.

Most Montana landowners are interested in, proud of, and enjoy the wildlife associated with their properties, even while acknowledging the challenges posed by wildlife and the occasional conflicts. Some landowners are deferential to wildlife and have a high degree of tolerance for conflict, even promoting wildlife habitat and wildlife use of their lands. In some cases, wolves in particular are welcomed. But history has demonstrated that wolf presence can create problems for landowners trying to raise livestock. Financial losses may result directly from wolf depredation. Indirect costs may accumulate because of increased management activities or changes to agricultural operations. These financial hardships accrue to individual farmers and ranchers and may be significant to them. What makes wolf-livestock conflicts unique from other wildlife-livestock conflicts are the changes in the legal status of wolves through time. Historically, farmers and ranchers had the latitude to take care of problem wolves themselves. Since 1973, wolves have been legally protected by ESA and state law. Livestock owners have had limited flexibility to protect their private property.

Regardless of historical events and how present circumstances evolved, tolerance for wolves on private property has been fundamental to the overall success of the federal wolf recovery program. This is highlighted by Montana's patchwork of public and private lands and how wolves have distributed themselves. During the state's scoping process for this EIS, wolf presence on private property and how wolf-livestock conflicts would be resolved (in the context of livestock being private property) were also raised.

Hybrids

Hybrids result from the breeding of *Canis lupus* with domestic dogs (*C. familiaris*), resulting in variable combinations of physical traits and behaviors. Much of the normal predatory behaviors of wild wolves disappeared in domestic dogs. But the predatory instincts are still present to an unknown and unpredictable degree in wolf-dog hybrids. Although hybrids commonly lack a fear of humans, the animals are generally poorly adapted as domestic pets because their behavior is unpredictable and their response to general obedience training is poor. While the keeping of captive wolves and hybrids as pets is rewarding to some individuals, others find it unmanageable and try to find new homes for their pets. Hybrids have been released into the wild and others apparently escaped from their owners. The potential for genetic pollution of wild populations, human safety issues, and erosion of public acceptance for wild wolves are commonly cited problems with private ownership of captives or hybrids and release of these animals in the wild.

Methods to distinguish non-native wolf-like canids from native wild wolves in the northern Rockies include a combination of genetic analyses, morphology, and behavior (Boyd et al. 2001). At present, there is no genetic or other evidence that captive wolves, wolf-dog hybrids, domestic dogs, and coyotes interbred with native Rocky Mountain wolves in the wild (Boyd et al. 2001). Wolves and coyotes can be easily differentiated genetically. However, current genetic tests cannot distinguish between wild wolves, domestic dogs, and wolf-dog hybrids. Because domestic dogs evolved from wild wolves, they have

similar genetic characteristics. It is unlikely, however, that a released captive or wolf-dog hybrid would survive long enough to reproduce with wild wolves (Bangs et al.1998). The concern about genetic pollution in the northern Rockies population is overstated.

There are behavioral differences between wild wolves, wolf-dog hybrids, and captive wolves. These differences provide important clues to managers in situations where the origin of the animal is not known. Released captives and hybrids will typically associate with humans and loiter near human settlements for periods of time that are much longer than expected compared to a wild wolf traveling through an area. They may even be more likely to depredate domestic animals than wild wolves (Bangs et al. 1998). In the tri-state area, wolf-dog hybrids have been found in the wild sporadically since at least 1986 (Bangs et al. 1998). Two cases in 1997 were south of YNP. In each case the animal loitered on private property, scavenged, and one killed domestic sheep. Both animals were euthanized. Two cases that were reported in northwestern Montana in 2002 had similar case histories (Meier pers. comm.).

Across the U.S., wolf-dog hybrids have been responsible for human attacks, maulings, dismemberments, and deaths. Many incidents involved children. The animal's large size, lack of fear, and unpredictable behavior make it especially problematic. As of 1997, the Food and Drug Administration had not approved rabies or other vaccines for use with captive wolves or hybrids. Despite lack of approved vaccines, many captive wolf or hybrid owners use the standard dog rabies vaccine. Nonetheless, there is still concern for public safety.

It is legal to possess captive wolves and wolf-dog hybrids in Montana. Citizens may keep them as personal, private pets without a permit. Citizens wishing to publicly display captives or wolf-dog hybrids or to attract trade must have a permit from FWP. Montana statutes (87-1-231) and administrative rules require the permanent tattooing of any wolf held in captivity, where "wolf" means a member of the species *Canis lupus*, including any canine hybrid, which is $\geq$ 50% wolf. Owners are also responsible for compensation and damages to personal property caused by any wolf that is held in captivity or that escapes from captivity.

Cultural, Archaeological, and Historical Resources

Evidence of about 12,000 years of human occupation of the Montana landscape is divided into prehistoric archaeological sites (such as stone circles, lithic scatters, or bison kill sites) and historical sites (such as homesteads or railroad depots). Although documentation suggests preferred areas of use and occupation, no environmental/topographic zone can be ignored as having potential for containing cultural resources. The value of cultural resources lies in its potential to provide information about societies past. The gray wolf attained a cultural significance to many Native American tribes. The wolf recovery areas contain lands that the tribes used traditionally and continue to do so today.

FWP's Parks Division is responsible for preserving and managing important historical and cultural resources that are incorporated within the state parks system. Examples are Ulm Pishkun, Bannock, Chief Plenty Coups, and Traveller's Rest.

Physical Environment

Air

Air provides for the exchange of gases basic to life, whether plant or animal.

Soil

Soil is a basic natural resource essential for plant growth and animal survival. Rich, healthy soil supplies nutrients for vegetation upon which wildlife depend for food and cover. Montana has a diverse landscape of soils, varying with geological parent material, climate, vegetation, rates of weathering, and human manipulation such as logging, mining, and agriculture. Human manipulation affects soils through compaction, erosion, and changes in chemical composition including accumulation of toxic chemicals.

Aquatics / Water Quality / Fisheries

Montana is dissected by 178,896 miles of streams and contains more than 10,000 lakes, reservoirs, and ponds for a total of 979,433 acres of water surface. Groundwater is important for agriculture, commercial industries, municipal and rural residential purposes. Surface water is valuable for wildlife and recreation. Wetlands are areas where water saturation is the dominant factor influencing soil, plants, and animal communities (Cowardin et al. 1979). Wetlands are important riparian ecosystems in the regulation and maintenance of rivers, lakes and groundwater systems. They also maintain water quality and improve degraded water by assimilating nutrients, reducing sediment load, and processing some chemical and organic waste. Wetlands and riparian areas are the most biologically productive ecosystems, and are particularly critical to maintain a diversity of wildlife. Waterfowl, wading birds, and shore birds use wetlands for feeding, nesting, migration, and wintering.

Over 11,000 individual waters support 90 species of fish. Of these, 56 are native to Montana, two others are possible natives, and the rest were introduced. Thirty-one species are classified as game fish under Montana statutes. Eighteen species are listed as “species of special concern”, two are listed as federally endangered, and one is federally threatened. Several other species are candidate species for listing under ESA. Fishing is a popular pastime. About 34% of all residents purchase fishing licenses annually.

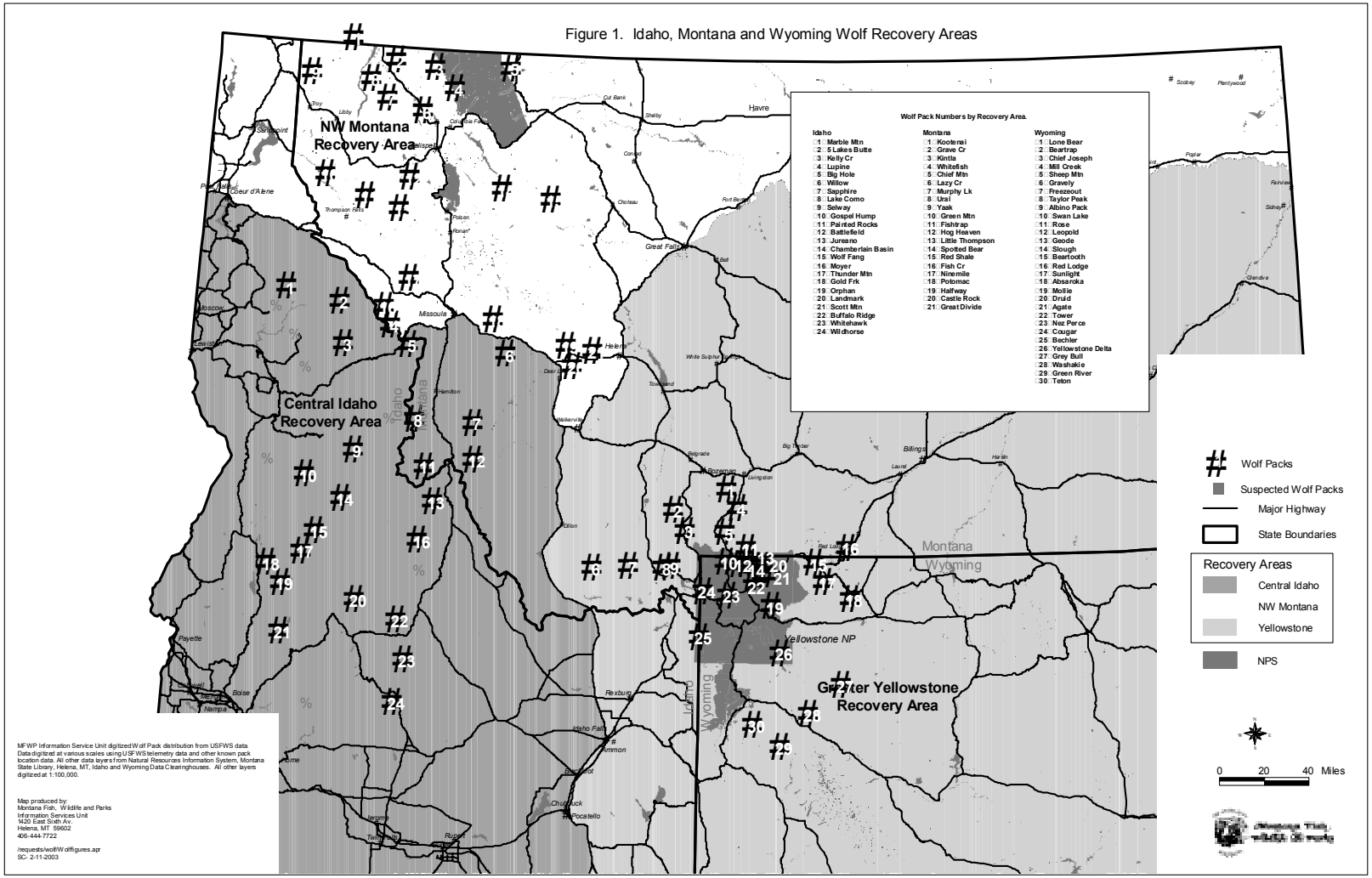

Figure 1. Wolf pack distribution in Montana, Idaho, and Wyoming, federal recovery area boundaries, and state boundaries (shown in bold). Large symbols represent established packs. Small symbols indicate newly formed packs or packs whose status is unknown at the present time. (Source: USFWS et al. 2002 and USFWS unpubl. data as of February 2003).

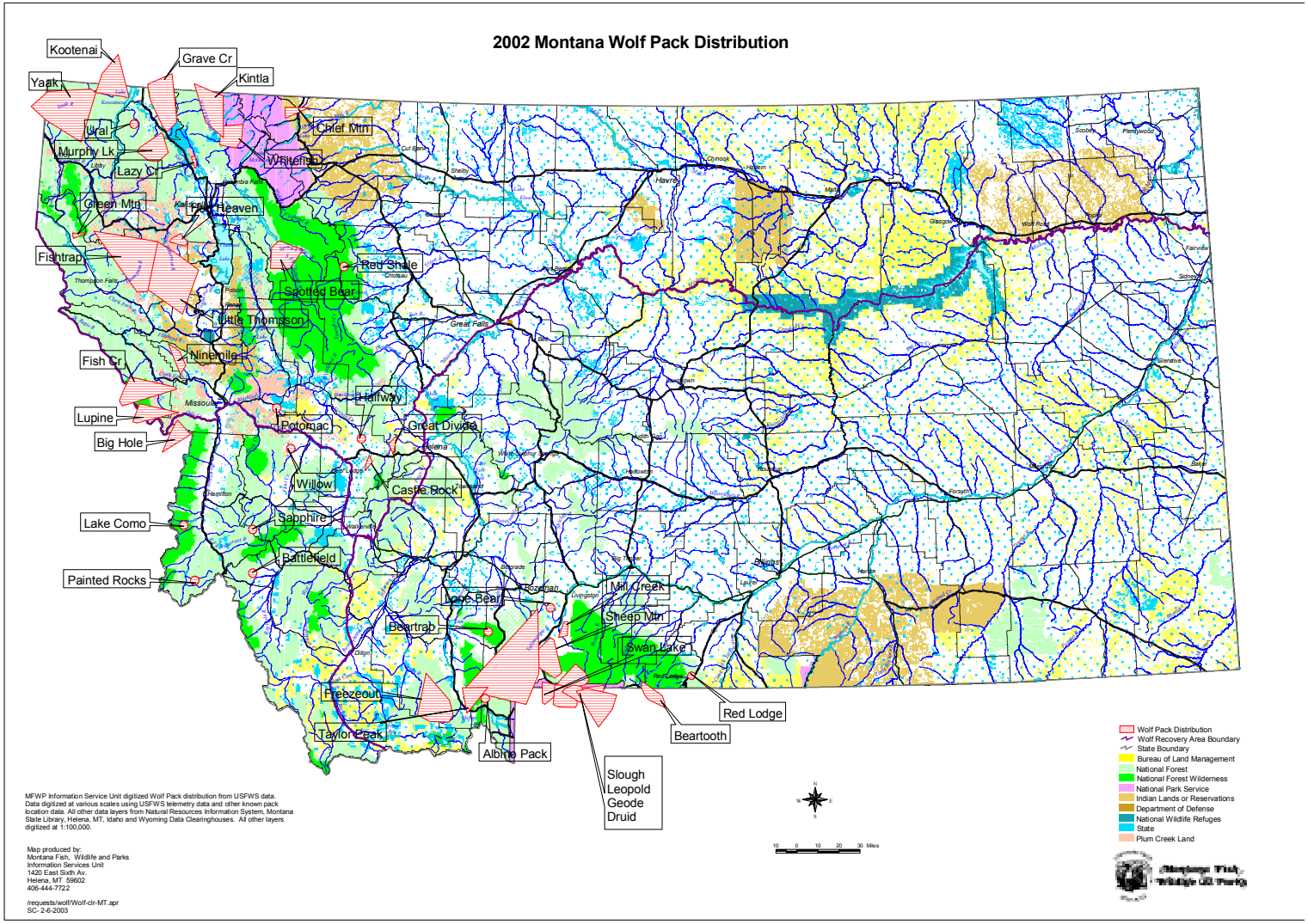

Figure 3. Wolf pack distribution and land ownership patterns in Montana. Approximate wolf pack territories are designated by the polygons with horizontal lines. Gray tones represent public lands and white indicates private lands. (Source: USFWS et al. 2002 and USFWS unpubl. data as of February 2003).